The AUTOMOBILE

Vol. XXXV
No. 11

NEW YORK, SEPTEMBER 14, 1916

Ten cents a copy
Three dollars a year

"What a Fool"—

—said a man the other day as he watched a perspiring car owner laboriously inflating his tires by hand.

"For the modest sum of $12 that man can get a Stewart Tire Pump—let his motor do the work and get full mileage out of his tires in the bargain."

Dealers—tell this to every car owner that comes into your sales room and you'll do business!

"It will pay you to see that the car you buy is equipped with Stewart Products"

The Stewart-Warner Speedometer Corporation
Chicago, Ill., U. S. A.

Stewart

Motor Driven Tire Pump

$12

The Automobile

Vol. XXXV New York—Thursday, September 14, 1916—Chicago No. 11

Maxwell Earnings Gain 135%

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Car Sales Increase 88% Over 1915—Can Make 100,000 Cars Per Year

New York City, Sept. 13—Maxwell earnings have increased 135 per cent over last year and 260 per cent in the last 2 years, according to the annual statement issued by Walter E. Flanders, president of the Maxwell Motor Co., Inc., to the stockholders. The surplus earned in the last year was equivalent to 30 per cent on the common stock after allowing 7 per cent on the first preferred and 6 per cent for the second preferred. The report states that the surplus earnings after a deduction of $500,000 for depreciation were $5,426,000.

Net Assets $11,176,783.26

The net working assets of the company and its subsidiaries at the close of its third fiscal year are $11,176,783.26, an increase as compared with the close of the second fiscal year, of over $3,500,000 and an increase as compared with the close of the first fiscal year, of over $5,000,000.

Cash on hand is $3,269,552.50 as compared with $2,652,628.60 at the close of the second fiscal year, and $1,175,992.68 at the close of the first fiscal year.

The inventories have been taken on most conservative lines, without any element of profit due to advanced prices for materials purchased under favor contracts.

The number of cars sold by the Max-

(*Continued on page* 462)

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August a Record Month for Paige

Detroit, Sept. 8—For the month of August just closed, the Paige-Detroit Motor Car Co. established a new record for volume of business done. Although August is not generally regarded as a big month with automobile manufacturers, nevertheless Paige transacted in the 31 days $2,020,000 worth of business, which is the greatest month's showing in the concern's history.

In making this announcement, Paige points out that the figures quoted do not tell the whole story, however. The demand for immediate shipment was much larger than the total volume of business would indicate. It was necessary to hold up orders for 1982 cars, and place the delivery of these in September. It is believed that the present month will even exceed the August record.

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Willys-Overland Capacity for 1917 Is 300,000

Toledo, Ohio, Sept. 12—By the end of the present year the Willys-Overland Co. will be in position to manufacture 300,000 cars annually, according to a statement by John N. Willys, president of the company.

The total outlay for this construction and additional equipment will be less than $5,000,000 and will terminate, temporarily at least, the company's policy of expansion, which has made Overland the second largest car manufacturer in the world.

From this time on, Mr. Willys states, the energies of the organization will be devoted to reducing costs, increasing efficiency and improving production.

The recent sale of 600,000 shares of common stock has placed the company in such financial position that no further increase in preferred or common will be required for its expansion. The statement of assets and liabilities as applied to the balance sheet of June 30 last, shows that upon payment for the new stock, the company will have more than $20,000,000 cash on hand and more than $25,000,000 of other quick assets.

Mr. Willys owns a majority of the common and states that it is his intention to continue personally to control and direct the affairs of the company.

United Motors Corp. Buys Klaxon

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Sixth Accessory and Parts Concern To Be Merged—McConnell President

New York, Sept. 12 — The Klaxon horn business has been taken over by the United Motors Corp., which was formed several weeks ago as a merger of five parts companies. The Lovell-McConnell Mfg. Co. of Newark, N. J., which built the horn business, will become the Klaxon Co. and F. Hallett Lovell, Jr., president and principal owner, will retire from active connection with the company, although he will remain a director.

The Lovell-McConnell plant will be doubled at once to provide for increased production. Simultaneously with the consummation of this merger, comes a statement from the Willys-Overland Co. that it will discontinue the manufacture or horns and will close a contract with Klaxon for a term of years.

Contracts are also being executed for the use of the Klaxon horn on the Cadillac, Buick, Oldsmobile, Oakland, Scripps-Booth and Chevrolet. It is used on many other cars.

D. A. McConnell, who has been vice-president since the concern was organized, about 9 years ago, will become president; Otis C. Friend, who recently retired from the Mitchell to join the United Motors, will be the new vice-president, and Walter P. Coghlan, who has been secretary, will become secretary and treasurer. While Lovell will remain a director, his time will be chiefly devoted to other concerns.

The United Motors Corp. includes besides the Klaxon, the Perlman Rim Corp., Remy Electric Co., New Departure Mfg. Co., Hyatt Roller Bearing Co., and Dayton Engineering Laboratories Co., maker of Delco electric systems.

Ford Races Draw 10,000

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Rebuilt Cars Average Well Over 60 M.P.H. on Chicago Speedway

CHICAGO SPEEDWAY, Sept. 10—Fords that looked like Fords and some that did not showed their speed proclivities today in the world's first Ford speedway race. If any of the 10,000 spectators came with any doubt as to rebuilt Fords doing a mile in a minute or less they went away with minds relieved of that feeling. They saw 20 miles run at an average of 62.83 miles per hour, 30 miles at 60.4, and 50 miles at 62.5 miles per hour, first honors in the former and latter going to Paul D. Harvey, Oak Park, Ill., whose car carried No. 1, and bore a striking resemblance to Dario Resta's blue Peugeot. Just to show that his car had some reserve speed, Harvey did a lap in the 50-mile event in 1 minute and 35 seconds, or at the rate of 72.5 miles per hour. This came immediately after he lost the lead at the end of 38 miles through a stop at the pits to change a spark plug.

Harvey's time for the 20 miles was 19 minutes and 6 seconds, and his average speed 62.83 miles per hour. Laznasky's time was 19 minutes 12.4 seconds; speed, 62.49. Jury finished in 19 minutes and 21.4 seconds, his average being 60.7 miles per hour. H. A. Wolf, Desplaines, Ill., was fourth in 20 minutes and 44.2 seconds; speed, 57.87 miles per hour. The others were flagged. Harvey won $125; Laznasky, $75, and Jury, $35.

The Illinois Championship

The second race of the afternoon was for the Illinois State championship, limited to Illinois entries only, and was for 30 miles. Eight cars started and stellar honors went to B. F. Davis, Paris, Ill., who turned the fifteen laps in 29 minutes 47.3 seconds. His average being 60.4 miles per hour. Only once did he give up the lead, Verne Abbott, Woodstock, Ill., heading him across the tape at the end of 26 miles. He regained his position, however, before the next lap was completed and finished 6.3 seconds ahead of Abbott, whose total time was 29 minutes 53.6 seconds, an average of 60.2 miles per hour. Third place went to P. F. Walter, Merrillville, Ind., in 32 minutes and 36 seconds, a speed of 55 miles per hour.

Harvey led throughout the 50-mile race except for the one lap as mentioned previously. Davis was a close contender up to 32 miles and it seemed to be a toss-up between them until a broken connecting rod put the Paris (Ill.) car out of the running. At 10 miles Harvey's time was 9:28:6; speed, 63.25; 20 miles, 18:39:6; speed, 64.25; 30 miles, 27:47; speed, 64.75, and his finish 48:10, speed, 62.5 miles per hour. Laznasky was second, in 48:08:6, and his speed was 61 miles per hour. Henry Mueller, Chicago, was third, his time being 52:35:4, and his speed 57 miles per hour. Peter F. Cordell, Oak Park, Ill., finished fourth, his time being 52:45:6.

The interstate championship, or 50-mile windup, carried a $500 first prize, $100 second and $50 third. Thus Harvey, by winning $125 in the first event and $500 in the final, won $625. He was the only entrant to win two prizes. How these cars were rebuilt is told on pages 465 and 466.

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1917 Elcar at $795

NEW YORK CITY, Sept. 8—The 1917 Elcar, selling at $795, has been announced by the Elkhart Carriage and Motor Car Co., Elkhart, Ind. There are two body types, the Clover Leaf roadster, seating four passengers, and a five-passenger touring car.

The specifications include a long-stroke motor, 3½ by 5; unit power plant; three-point suspension; 114-in. wheelbase; full-floating rear axle; Delco ignition; full Turkish style upholstering.

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Applications Now for Show Space

NEW YORK CITY, Sept. 13—Application blanks for floorspace and diagrams have been issued for the seventeenth annual automobile shows by the National Automobile Chamber of Commerce. They must be returned, filled out, by Sept. 30 in order that the applicants may participate in the drawing for the first allotment which takes place at the Chamber of Commerce headquarters on Thursday, Oct. 5. The New York show will be at the Grand Central Palace from Jan. 6 to 13. The Chicago show will be at the Coliseum and Armory from Jan. 27 to Feb. 3.

As usual, there will be two departments of the automobile section, which at New York will include the first and second floors of the Palace. There will also be wall space on the third and fourth floors. At the Coliseum and Armory the automobile section will include all of the main floors of both buildings. The remaining space will be devoted to accessories, parts, motorcycles, etc. The price per square foot is as follows: New York, $1.10 to $1.50; Chicago, 75 cents to $1.25.

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White Co. to Erect Addition

CLEVELAND, OHIO, Sept. 11—The White Co. is to add a $200,000 building to its present manufacturing facilities. It will consist of a one-story concrete and steel structure 241 by 304 ft. This will be built at the northeast corner of the present plant.

Reo Truck and Car Combine

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Directors Believe One Organization Better in Handling Increased Business

LANSING, MICH., Sept. 8—The Reo Motor Truck Co. and the Reo Motor Car Co. are to be formally consolidated by an exchange of the shares of the truck company for an equal number of shares of the car company.

According to an announcement sent out to-day to the stockholders of the two companies the directors of the Reo Motor Car Co., who are also directors of the truck company, after careful consideration, believe the interests of both corporations will be best served by such a move. The same executive, selling and office organizations have endeavored to handle the business of both, and up to this time the same motors and many parts manufactured by the Reo car company have been used by both companies. However, changes in design and further development of the business will make such an arrangement impractical, it is stated.

Increased business, it is pointed out, has correspondingly increased the difficulties in handling the affairs of the two corporations separately, and makes it impossible to secure the results that the directors are convinced can be obtained through one well-organized corporation and administration.

Administration Simplified

Accordingly, the Reo Motor Car Co. will purchase all Reo Truck stock delivered to the Capital National Bank, Lansing, or to Secretary D. E. Bates of the Reo Motor Car Co., on or before Sept. 20th, and pay for these shares with car stock.

The car stock has been selling on the Detroit Stock Exchange around $44 per share, and the truck stock some 5 points under it, but to-day the truck stock climbed to the same figure as the car.

Buys Three Blocks

A tract of land covering three city blocks located south of the Grank Trunk railroad tracks and extending to the Michigan Central tracks, have been purchased by the Reo Motor Car Co. Together with other land purchases made in that section of Lansing, the Reo company now has nearly half a mile of land along the Grand Trunk tracks. The purchases have been made to be prepared for further extensions of the plants of both the Reo car and the Reo truck companies, and it is not unlikely that the erection of new buildings will be started in the near future.

Motor Products Gets Lozier Plant

$1,000,000 Deal Gives Lozier Present Plant of Rands Mfg. Co.

DETROIT, MICH., Sept. 8—A deal said to involve a $1,000,000 consideration has been closed here between the Motor Products Corp. and the Lozier Motor Co., whereby the large modern plant of the Lozier company comes into the possession of the Motor Products Corp. The Lozier company does not go out of existence by this move, however, for it will take over the plant now used by the Rands Mfg. Co., one of the subsidiaries of the Motor Products combine.

The Lozier plant is a large group of up-to-date factory buildings located on Mack Avenue, on the west side of the city, and covering about 62 acres. There is an attractive administrative building in front of the factory structures, and a power plant for supplying ample power for all machinery. It was occupied by the old Lozier company prior to the reorganization, and has since been used for the manufacture of Lozier cars by the new Lozier concern.

Motor Products Corp. was organized in May of this year, with a capitalization of 100,000 shares of no par value, as a holding company for several large parts manufacturers located in Detroit and vicinity. The Rands Mfg. Co., maker of windshields, tops and steering wheels; the Vanguard Mfg. Co., specialist in windshield manufacture; the Diamond Mfg. Co., producer of automobile metal stampings; and the Universal Metal Co., maker of metal parts and possessing a large tube mill are all parts of the Motor Products Co. and located in Detroit. Besides these, the combine includes the Superior Mfg. Co., Ann Arbor, Mich., which is also a windshield and metal parts producer.

To Concentrate

The acquisition of the large Lozier works is the first step toward the concentration of the activities of the consolidation, and it is pointed out by one of the officials that the new plant will allow Motor Products to realize at once the fundamental purposes for which the company was formed. By means of this concentration in one plant, it will not only enable the concern to put in effect some great economies in manufacturing, but will enable the securing of managerial co-operation such as could not be attained while a number of plants were operating as separate units.

Motor Products is headed by well-known men in the industry. W. C. Rands is president; C. F. Jensen, vice-president; H. H. Seeley, vice-president; D. B. Lee, treasurer and general manager; M. L. Brown, secretary, and R. R. Seeley, director and production manager.

In addition to concentration in the new property it is the intention to make large additions to the tube mill to keep pace with a growing business, and to continue the Ann Arbor plant on special work, besides the expanding of the Walkerville, Ont., plant to care for an increasing Canadian business.

The plant that goes to Lozier, and up to this time has been occupied by the Rands subsidiary, was formerly the home of the Warren Motor Car Co., now out of business. Being constructed primarily for the making of automobiles, the Lozier people expect to effect economies in manufacture of their car. The buildings are of brick and occupy a site covering 6 acres. This property is said to be valued at $300,000. The cash received from the sale of the Lozier plant will be utilized as working capital by the Lozier concern, and plans for refinancing will bring new money into the business, according to Samuel Frank, secretary of the concern.

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Watson Asst. to Haynes, Gen. Manager

KOKOMO, IND., Sept. 14—Don L. Watson, for the last year sales manager of the Haynes Auto Company, has been promoted to the office of assistant general manager, a newly created position. He will do a large part of the detail work in the general manager's office.

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Davidson Resigns from Continental

DETROIT, MICH., Sept. 8 — Wm. J. Davidson, of the engineering department of the Cadillac Motor Car Co., has resigned to take up other lines of activity in the industry.

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Pike Heads Paige Efficiency Dept.

DETROIT, MICH., Sept. 8—The recently established efficiency and sales promotion department of the Paige-Detroit Motor Car Co. is to be managed by C. S. Pike, who comes from the sales department of the Burroughs Adding Machine Co., this city.

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Batchelder Asst. Sales Mgr. of Dort Co.

FLINT, MICH., Sept. 8—C. F. Batchelder has been appointed assistant general sales manager for the Dort Motor Car Co., this city. He was for 10 years general sales manager of the John Deere Plow Co.

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Bradley Is Paige Purchasing Agent

DETROIT, MICH., Sept. 8 — Thomas Bradley, for 5½ years with the Paige-Detroit Motor Car Co., as assistant in the purchasing department, has been promoted to the position of purchasing agent, following the resignation of P. E. Stroup, former purchasing manager.

Harroun Cars by Show Time

To Make 25,000 Cars Next Year—Work on Design for 2 Years

NEW YORK CITY, Sept. 13—Papers will be filed to-morrow at Wilmington, Del., incorporating the Harroun Motor Corp. for $10,000,000, all common. Ray Harroun, well known as a racing engineer, and for his connection with the Maxwell racing team, has been working on this car for 2 years. The first car is now ready and there will be ten sample cars ready for the national shows in January. Production will start for dealers in March and by May 1 the organization is expected to be embarked on quantity production. It is planned that 25,000 cars will be made between May 1 of the first year and May 1 of the second.

Many Pressed Steel Parts

The car will be distinguished by a large number of pressed steel parts. It will sell for $595, and this low price will be met largely through the elimination of machine work by using the stampings. Such parts as the spring seats, brake, spiders, differential carrier, spring shackle, etc., will be manufactured in this way, thus cutting down labor to a minimum. While definite specifications of the car cannot be announced at the present time, it will have a four-cylinder high-efficiency motor with the valves probably in the head. The wheelbase is 107 in., and the first cars at least will have five-passenger bodies.

John Guy Monihan is president of the new organization. He was formerly with the Premier company and was later vice-president and general manager of the Marion. Ward Macy will be in charge of sales and Paul Bruske of advertising. The plant site will be located near Detroit.

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DePalma Mfg. Co. Buys Plant

DETROIT, MICH., Sept. 8—The DePalma Mfg. Co., composed of Ralph DePalma and Frank Book, the latter a Detroit capitalist, have acquired a factory building on East Woodbridge Street for about $23,000, it is stated. The plant will be utilized for the manufacture of racing automobiles under the direction of the veteran driver, DePalma.

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Kirkpatrick Is Hood Vice-President

DETROIT, MICH., Sept. 8.—W. H. Kirkpatrick, for 9 years head of the sales department of the Peerless Motor Car Co., Cleveland, has been elected vice-president of the Wallace C. Hood Service Bureau here.

ACCESSORIES In South America

No. IV

U. S. A. Tire Firms Should Become Strongly Established—Underinflation and Rim Cutting Main Troubles

By David Beecroft

ONE thing is certain, namely, that we should establish ourselves as strongly as possible to-day. Do not let us establish ourselves on shifting, uncertain sands, but on the bedrock of sound business. Sound business with South American houses is to give them our best prices, and is not to exact as high a price as we can get solely because competition is for the time cut out. It is expected that in a few months competition among U. S. A. tire firms may bring the price question to a legitimate adjustment.

Take a page from a day's conversation in tire repairs. One large supply dealer stocked up with a U. S. A. cement which cost him nearly 10 per cent more than the European cements he had previously handled. He could not get the European goods and had to take ours. He did not like paying a higher price for ours, but had to. As soon as he can get the European brands at the old prices he says he is going to. In the meantime is it not better business for our concerns to give lower prices where possible and cut the profits for the purpose of getting more firmly established? That is the way Germany got in so strongly. The Germans were willing to cut profits and get volume. We should to-day aim at the same objective.

Fancy Repair Cans

We need to put some of our tire repair goods up in more attractive cans. Europe can teach us lessons in how to put goods up in clean, business-looking tins. Several samples of our goods seen in two or three places had faded labels, and in others the labels were stained. From the buyer's viewpoint the goods looked old. Put yourself in the buyer's place. Walk into a supply house and see if clean-looking cans with clean labels are not attractive.

When goods come from a foreign country and from firms that we do not know much about our first impression of the goods is obtained from the way they are put up. If they are in clean, businesslike cans we are attracted. Our first impressions of those goods are favorable. We approach them with a fair feeling. If, on the other hand, the labels are stained or faded we approach them with mental uncertainty. We are not quite certain the goods are fresh. We think that some dumping act is being worked on us. Clean labels pay.

Some business questions will come up with regard to marketing tires in South America. Some of our concerns are already consigning stocks to certain large distributers. They find it necessary and they think it good business to do so and thus firmly establish themselves. In this way they are assured of always having a good stock on hand to distribute.

One or two other concerns that do not believe in consigning tires are giving their wholesale distributers very close prices and are giving 3 months' time and perhaps taking a few notes for longer periods. There is no reason why this cannot be done, because many of the large jobbers are just as reliable as any you can find in the U. S. A. With the National City Bank and its five branches and large credit departments in the five largest cities in Brazil, Argentina and Uruguay, there is not any difficulty with regard to credits. You can get any credit rating information you may desire. Dun's and Bradstreet's are also there. True, it takes a little longer time to get some of the credit ratings, but time is more of an element in all export business.

Tire Stocks

We told recently of how Michelin stocked heavily with his tires at several South American ports; of how he paid the import duties and of how he could make deliveries in a day or two to nearly any point in the different countries excepting those distant interior parts. We might also have told of the good business of the Michelin firm in having quantity contracts which when the dealer's sales reach a given volume within a year he gets an additional discount. This proved excellent business and is still proving excellent business with this enterprising firm.

The anti-skid rubber tire of our U. S. A. factories is more or less of a novelty to Buenos Aires and Brazil and to the citizens of many other cities. The European tire business consisted largely of the steel-studded tire that is used on one rear wheel and on the opposite front wheel. You see thousands of these in Buenos Aires and Rio, just as you do in London and Paris. A city ordinance in Buenos Aires required steel-studded equipment, so it was necessary for our tire dealers there to demonstrate before the traffic department of the city to prove the efficiency of the rubber-tread tire. This has been satisfactorily accomplished, and to-day there is no barrier to the sale of such tires.

Many Plain Treads

It is surprising how many plain tread tires are in use in many cities. In Sao Paulo, Brazil, you very rarely see a rubber non-skid. The taxi drivers all use plain treads and drive in the rain without chains. It is surprising how they get along and the speeds at which they travel. Already our tire people are putting on compaigns for their rubber treads.

and it is certain that good headway will be made. Undoubtedly when the European tire makers come back into the field they will have to come with rubber treads as well as steel treads.

U. S. A. tires generally got into the South American market in cart-before-horse fashion. We got in bad instead of good. We got a terrible reputation for rim cutting, for having cheap tires and tires that did not stand up. Fortunately we are getting over it, but not entirely.

Our Bead Trouble

Here is how it happened: Several of our tire builders, realizing that metric sizes were needed for South America, built metrics with beads to fit the standard English rim. When they got on the South American market they found the Michelin rim dominating the field. The Michelin rim differs from the standard English rim in that its hook to contain the bead is deeper radially. When our tires were put on these rims the bead did not fill the hook and the pressure came on the side of the tire, where it contacted with the edge of the rim. Rim cutting followed.

It was some time before explanations reached our factories and the correct tires reached South America. Then, too, some of our metric sizes were too small in tube diameter, really undersize tires. That got us in bad. Now, fortunately, one or two of our concerns are marketing metric sizes in South America that are of larger capacity than the European makes.

South America wants good tires. The car owners will pay for them, but they must have the mileage. It is not a question of our supplying the cheapest tire as much as it is supplying the best tire. We cannot afford to send anything but the best. One U. S. A. citizen who has lived in Buenos Aires for several years told of the errors of some of our undersized goods and of how essential it is to give good goods, particularly if we hope to hold the business. He further impressed on me the necessity of as low prices as possible. It is better for us if we are not ready with the right tire not to enter the field until we are. One of our large concerns followed this policy. It refused to sell in Argentina or Brazil until it had the correct bead and also the correct tire section. As a result, within the last few months it has been meeting with remarkable sales.

In one or two South American cities—namely, Sao Paulo and Montevideo—certain tire troubles may develop because of underinflation. This applies also to Santos, Brazil, where pavements are below the average. Rim-cutting complaints may come from these cities due to no fault of the tire. This underinflation regime will have to be counteracted. The United States Tire Co. in June started circulating in Portuguese a little tire booklet in Rio, Santos, Sao Paulo and other Brazilian cities showing the evils of underinflation. Good results were bound to follow and other concerns may have to actively take up this work.

(To be continued)

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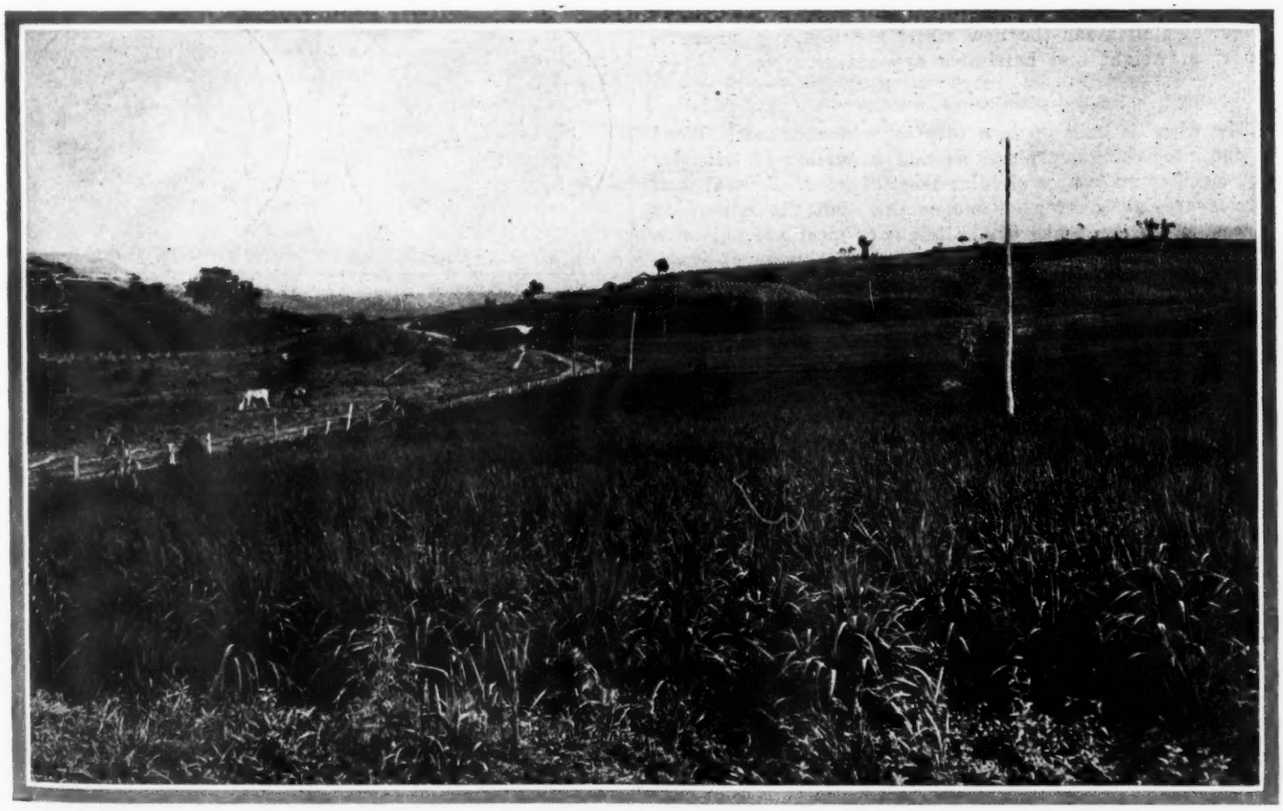
Venezuela Wants U. S. A. Cars

WASHINGTON, D. C., Sept. 2—The government of Venezuela, recognizing the supreme need for modern transportation facilities in that country, is active in encouraging the importation of motor cars and to that end has put them in the lowest or first customs class, the duty amounting to 68 cents per 100 lb. gross weight.

Gasoline is in the same customs class, but the expense attending the importation of the latter is such as to make the retail cost extremely high. The result is to limit the use of motor trucks, although it seems to have had little effect on the use of passenger cars.

Homer Brett, United States consul at La Guaira, is of the



General view of one of the great sugar cane sections of the State of Sao Paulo, Brazil. Although the coffee-raising industry of this State takes precedence among its commercial activities, Sao Paulo being the greatest coffee-growing region in the world, its large area, greater, in fact, than all New England, allows ample space for the cultivation of sugar-cane, etc.

view that there is a good future for automobiles in Venezuela. He says there are few countries where the modern motor car is so badly needed, due to the numerous towns and villages which have never heretofore been accessible except on muleback and which, because of the character of the country, never will be reached by railways. These isolated places, however, are the most healthful and the most prosperous in Venezuela, owing to their elevation and to the coffee crops produced near them.

The Venezuelan government, realizing the need for putting these out-of-the-way places in touch with the ports, is building wagon roads to all of these places. The result is that motor cars are penetrating to points heretofore not to be reached except by muleback, and they are making trips in two days which formerly required 2 weeks. In Ciudad Bolivar, on the Orinoco, there are numerous motor cars of North American make, and reports received from far beyond that point are to the effect every few days a motor car has reached some inland point in record time for that country as compared with the time made on muleback.

Reports received at La Guaira are that the invasion of Colombia by the North American-made machine has begun, and that it is being received with enthusiasm. Every steamer from New York these days carries a number of automobiles to different South American ports and the sales are steadily increasing each month.

The outlook in Peru just at present for the American-made car is only fair, but, as in other countries to the south, time is expected to work such changes as to open up a market worth cultivating. Cars of European make gained a foothold in Lima before the European war began, but the number in use there to-day is comparatively small. The streets of Lima are narrow and not well paved. Outside of Lima, the Peruvian roads are such that the successful use of motor cars upon them, until material improvements are made, is out of the question.

Electric cars are comparatively unknown in Lima. There probably are two or three such in use there. Later on, with electric power to be easily obtained in Lima, and at reasonable rates, the makers of electric machines might be able to build up a market there. Of the 300 or 400 cars in Lima, most of them are in the taxicab service, and of American make. It is the privately-owned car seen in Lima which is as a rule of European make.

Laminated Wood New Wheel Construction

Disk Design Is Strong and Light—Attractive in Appearance

THE latest idea in wheel building is to use laminated wood, the wheel appearing as a solid disk like a pressed steel wheel. This design has been produced by F. S. Merrill, Amesbury, Mass., Mr. Merrill being head of a firm that has been fifty-five years in the wheel building business. The principal claims for the new wheel are immense strength, moderate weight and handsome appearance.

Triangular Sections Combined

The wheel is built up in a very ingenious manner. Wood is cut into triangular pieces so that a number of triangles put together make up a circular sheet of wood. Several such circles are laid on top of one another, but the centers or places where the peaks of the triangles meet are not on a single center line. Suppose there are six layers of wood, then the center points of the six triangle assemblies will be spaced equally apart. Actually the points are arranged around a small circle, so that, if a nail was driven through each center the six nails would be six points on a circle. This is shown in diagram form in Fig. 1. Of course, when there are many layers the center points run in series. In the illustration the center points of the top series and of the bottom series are on the same line, but all the intermediate ones are staggered. The layers of wood are consolidated by heavy pressure. The inventor points out that this wheel, of which the strength is obvious, lends itself admirably to decorative painting. In natural wood it looks well, having none of that heavy appearance which often characterises a disk wheel of steel. The designs shown in Fig. 2 are suggestions for treatment in different colors and it is obvious that all sorts of patterns could be devised.

To Produce in Quantity

The wheels are at present obtainable by individual order at a cost of $175 per set of four, painted and finished in any style. It is expected that the factory will be open to consider the production of large quantities within a few months and the price would not be high when the necessary equipment is installed.

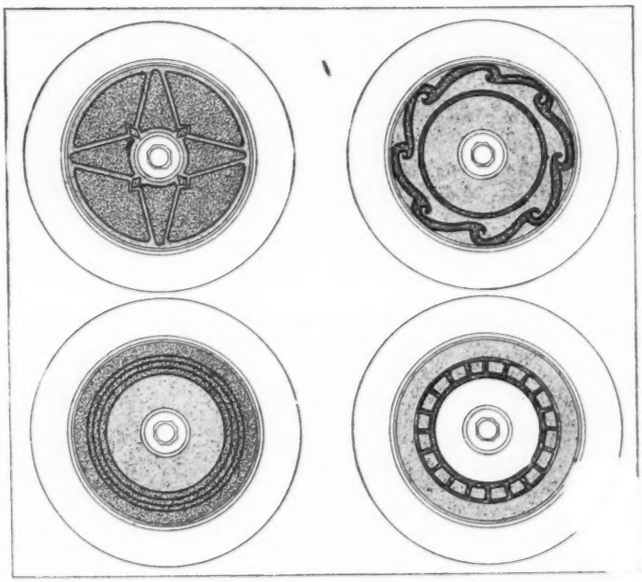


Fig. 2—Suggested schemes for painting laminated wood wheels in distinctive patterns

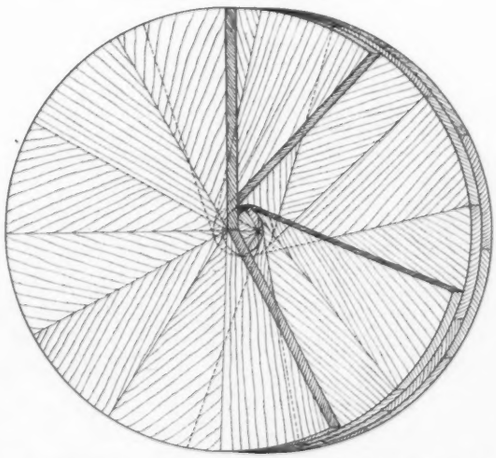
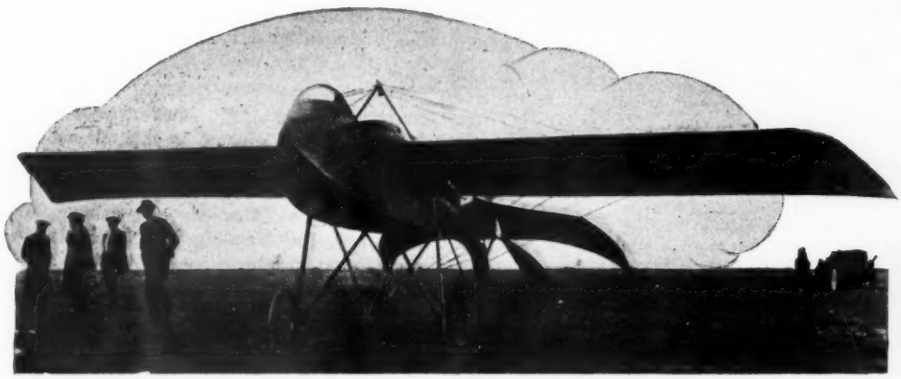


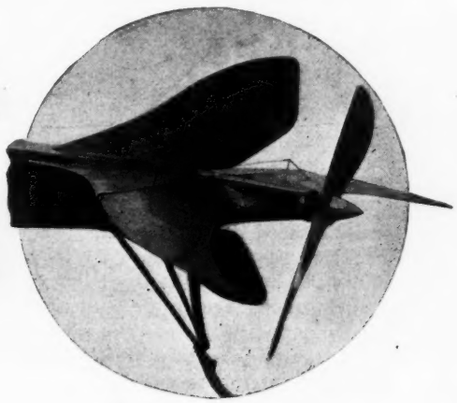
Fig. 1—Showing the construction of the laminated wood wheel in which each assembly of triangular pieces of wood has its center offset with respect to that of the next

Effect of the War on Aeroplane Engine Design

By Granville Pollock



Three-quarter front view of the Ruby monoplane, and, below, peculiar construction of the tail, showing propeller mounting

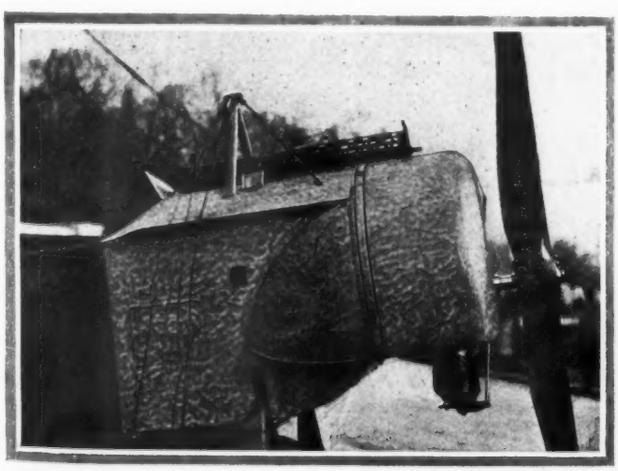


¶ EDITOR'S NOTE: *For over a year Granville Pollock, of Buffalo, N. Y., was connected with an anti-aircraft corps on the western front in the present war. He had direct charge of the Pierce-Arrow trucks used to carry anti-aircraft guns, as well as other trucks needed for various uses in the corps. Mr. Pollock lived in an atmosphere surcharged with aviation matters and had a good opportunity to observe the practical working out of different types of aeroplanes.*

AFTER having observed that several automobile companies in this country have undertaken the construction of aeroplane engines, and others possibly considering the same, the writer is of the opinion that a word or two on what he has seen of this subject would not be amiss, and would possibly clear up one or two errors that seem to exist in regard to the actual motor situation abroad.

Before going further, the writer wishes to make clear the fact that this is not intended as a criticism on any work or previous discussion of this subject, but is merely offered as the result of 22 months' residence in England and Europe, fully half of the time having been spent on the actual front and always at least indirectly connected with aeronautics.

Under these circumstances, he could not help noticing the various machines, engines and the uses to which they were put, but also the service they were actually giving and the preference of one type of engine over the other for certain classes of work, all this under the most trying and exacting conditions, i. e., military service.



Engine housing and machine gun of a captured Fokker monoplane. The engine is a rotary Oberursel

No Revolutionary Tendencies

Contrary to the general belief, there has been nothing revolutionary in development, and while this may have seemed the case to the casual observer, engine limitations had long been known and acted upon by the best plane designers in France and England, and while a preference had been given to rotary and air-cooled engines, it was but the natural outcome of working with what one had, and not a preference for this type on the whole.

The development of the stationary water-cooled engine in these countries had been extremely slow, partly the fault of the individual engine manufacturer, but principally due to the lack of official and popular support. A similar state of affairs is practically existing in this country to-day or at least has been until quite recently, and it is but to be expected that without sufficient incentive to the contrary, manufacturers will always work along the line of least resistance and most profits. Further, the production of a really successful and efficient aeroplane engine is anything but an easy matter, and to that end might be cited the fact that one of the foremost designers of Italy, who has been continually engaged on experimental work along this line for the past 2 or 3 years, has not as yet produced an article that he would care to put on the market under his name.

Three Power Groups

And to add to the mechanical difficulties of the work, there are also the elements of cost and the interference with usual production, two items of no mean importance, which can be readily appreciated by those concerns who have undertaken this class of work; as well as the possibility of not finding a ready market for the product when it is completed.

But to return to the subject, the engine question has gen-

A fleet of Pierce armored trucks with anti-aircraft machine guns. Note the heavy dual rear tires and nonskid chains; also shovels and other tool equipment

erally divided itself into three groups, the first being that of machines requiring power up to 100-hp.; the second from 100 to 200-hp., and the third from 200-hp. up. The first and second groups are by far the more numerous in point of numbers, and while a great deal of experimental work is being carried on with a view of utilizing more power, as yet very little of it has passed beyond this stage, although the writer has seen and examined planes with four and five different units mounted, totalling up to and in excess of 500-hp. However, as stated before, these have not passed the experimental stage sufficiently to make their appearance in the field of conflict.

Aerophane designers who have produced a machine that belongs to the first group have almost entirely relied for power upon the air-cooled motor, the rotary dividing honors with the stationary. The best example of this is the Renault, this being the standard recommended by the Royal Aircraft Factory for its B.E. type, of which hundreds have been built, and these are giving satisfaction within their limits of operation. There is also the Farman, which uses the same engine as a pusher.

Three Leading Rotary Types

Of the rotary type, the three well-known makes, Gnome, La Rhone and Clerget, have all been used to advantage, although where large power of, say, 100-hp. is required, the Gnome has had the preference in the mono-soupape, which, in proper hands, gives excellent results.

All these engines have their faults and have been severely criticized, and the loss of several good French pilots has been attributed to their failure to stand up under hard usage; but this has almost invariably been the result of working these engines beyond their limits, either in length of flights, or in overloads for too long a time, such as a fast scout plane might be subjected to in a battle with several adversaries where frequent loss of altitude was followed by periods of hard climbing, conditions that quickly tend to heat an air-cooled engine, and especially one that is partially inclosed for streamline purposes. These cases were frequently met with when a number of crack pilots were operating on the same front, and rivalry was carried to the limit, and it was only to be expected that if an engine had any weaknesses at all, they would be brought out under these conditions.

The natural question is to ask why these engines were not replaced by water-cooled ones that would not overheat and sieze, or lose power when worked to their limits of endurance, but to those conversant with the weaknesses of this type of engine for this use, viz.—fast scout planes, an answer is unnecessary. One has but to visit Les Invalides in Paris, where some of the trophies of the war are on view, to see one or more types of German planes mounting a Mercedes engine of this type, that have been brought down as the result of a single shot through the radiator, and they will see this clearly enough, although it is but one side of the question.

A fact remembered by few people is that a rotary engine when in proper condition will give its full power almost from the first revolution and that no preliminary warming up is necessary even in the coldest weather, and this in itself is invaluable where a quick get-away is required, or where hangars are not available and weather conditions are adverse.

The Center of Support

Another fact, and one that is of moment where a designer has to produce the limit in flying efficiency, is that the center of support of the engine is always the center of power and thrust, and often is the common center of head resistance, and not infrequently this line intersects the center of gravity of the whole machine. The true significance of this fact is more readily appreciated by the constructor than by the engine manufacturer, and not infrequently is the cause of mystification on the part of observers where this type of engine has defeated a stationary of similar or slightly greater power on a duplicate plane.

The rotating effect of the engine also is a factor in reducing the effect of power impulses on propeller vibration, and in inducing a certain steadiness of flight which is much appreciated by experienced pilots; and this, with the fact of always being able to switch the power off and on, more than compensates for the lack of throttling range as compared with that possible in the stationary type.

As proof of these features, one has but to recall the recent exploits of the German Fokker machines, which use exclusively the rotary engine. Had it been possible to get the same results with the standard water-cooled engine as used in all other types of German planes, it is most probable that it would have been done, for they are certainly easier and cheaper to manufacture, and more efficient as regards fuel consumption, but the fact that they were not so utilized is significant.

So much for the virtues of the rotary when used with reasonable care and within its limits. While the life of this type is entirely dependent on the attention given by the mechanics at the base, they will last just as long as any other engine, and while slightly more expensive in the cost of replacements, it is not uncommon to see 3 and even 4-year-old engines still in service, while many are still at the front that flew over the Channel at the commencement of

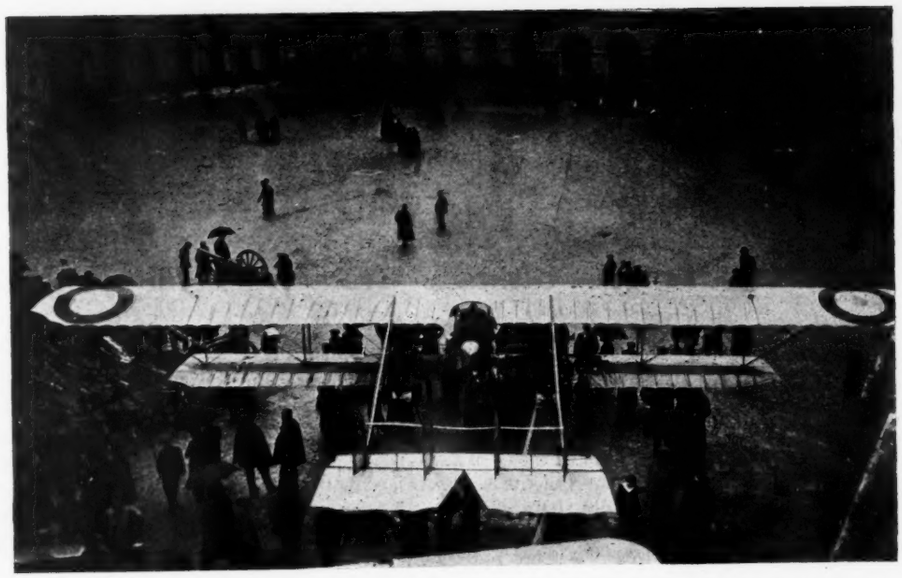
Side view of Pierce anti-aircraft armored car with the crew. This also shows the machine gun mounting

the war. Proof of their long life is to be seen in any of the school machines in England and in France; and at Hendon, especially, more pilots have been trained behind old "50" and "80" Gnomes than in all the rest of England combined.

Rotaries for Scout Work

That this type of engine will always be popular for the fast scout and dispatch class of work, where flights are for comparatively short duration, is the opinion of some of the best constructors in Europe; but that for any other uses where fuel efficiency is to be considered, then, of course, the other engine is unquestionably the best, as might reasonably be expected.

This, however, brings us to the second group of machines, viz.—those that are primarily intended for bomb dropping, lengthy periods of observance for artillery fire, raids and armed reconnaissance work, where loads are carried with power requirements up to 200 to 250 hp. Of engines for this class of work, there are many well suited to their work, comprising both radial, vertical and V types, although the six-cylinder vertical is by far the most popular and the most efficient for single installations; or where one single large power unit is not practical, two smaller ones are usually mounted out on the wings.



Caudron twin engine biplane on exhibition in Paris after being riddled with shot in active service

Austro-Daimler of High Power

Under these conditions, it has not only proved more efficient as regards actual power output, but is far easier to streamline and consequently diminishes head resistance, an item not to be overlooked on a large machine. Of this type, the best known is the Mercedes, although it is not by any means the best, as under comparative tests, the six-cylinder Austro-Daimler has shown a much higher efficiency, giving a power outpt that on occasions has risen to 147 hp., at 1400 r.p.m., a very high figure indeed when it is remembered that the propeller is not geared up, and working perfectly with only 3½ gal. of water!

In a case of this kind, it will be readily seen that two of these engines will give a higher efficiency than a single installation of, say, 250 hp., while propellers are regularly turned out by a prominent French concern that has no trouble in holding their efficiency at this speed and even higher.

This type of engine has been generally confined to the well-known two-seater tractor class of work, to which it is well adapted, as in this case it is usual to mount the engine with the heads exposed to get the benefit of the propeller draught, and also facilitate inspection or adjustment.

For this type of work there is no particular limits as to width of the mounting, and an eight is just as practical, although at high speeds the difference in vibration is not noticeable, as the success of the Renault eight has proven. It is, therefore, quite clear that there is nothing to be gained in increasing the number of cylinders or parts, as the efficiency does not keep pace with the complications for engines of this power.

Fuselage Design Problems

Fuselage design always has been a point of difference in opinion among the various designers, the smallest as to width or depth having always been Deperdussin, while such firms as Hanriot and Nieuport have always been noted for their deep-chested and broad construction, both types giving equal satisfaction in the hands of their respective pilots. It would, therefore, seem to be a matter of personal opinion and the class of work for which the plane was in intended, as machines with fuselages of one and even one and a half meters width have been seen by the writer to give excellent results, while the question of streamline or head resistance presents no difficulties, as a perusal of Eiffel's work on this subject will readily show.

On the other hand, when a machine of a size is built that requires over 250 hp., the purpose for which the plane is intended is generally such as to preclude the use of the forward part of the fuselage as an engine bed, and up to the present the tendency has been to mount them out on the wings so as to get the benefit of this large space for other uses, often mounting guns on the rails, which gives an extremely wide radius of action as well as permitting the wireless operator to work in peace away from the noise and the influence of the engines.

That this item is worth considering has been proven by the fact that the sending radius for wireless on planes has been extended to 200 miles by actual and frequent tests, which the writer does not hesitate to vouch for.

Mounting on the Wings

So far as the mounting of engines on the wings is concerned, the best results seem to be with not more than two different units, for while more have been tried and may eventually be used, the difficulty has been to mount them in such a way as to keep the slip-stream of one propeller away from the others, and not get the weights so far out on the wings as to make the whole machine cumbersome and heavy, to which is added the almost impossible task of keeping the engine speeds uniform.

With this in mind, the construction of really large power plants is now the most important of aeroplane engine work now going on in Europe, and units of 300, 350 and even greater are to be expected along shortly and undoubtedly these will be of the 12-cylinder V type, with a fairly wide range of throttle control, and a high fuel efficiency, though in this case the question of gross weight will not be the item it has been in the past, for in all probability the difference of a few kilos on an engine of this size will make very little difference to the size of the machine it is intended to propel. At all events it will be more up to the designer of the plane

(*Continued on page* 466)

Automobile Practice in Tractor Design

Many Valuable Pointers in Detail, Though General Features Differ Widely—Truck Construction Also a Possible Influence—Ultimate Tractor Engine of Automobile Type

By A. Ludlow Clayden

IN a previous article it was stated that the tractor to-day is what the automobile was in 1903, in so far as its detail development is concerned. The reason behind this is simply that the average tractor seems to be about as far away from the ideal as did the automobile 13 years ago. Examining a collection of tractors shows instantly that the new industry has much to learn from automobile experience in the way of obtaining reliability and durability. It probably has much to learn in detail design, but little if anything in general feature. That is to say, the tractor needs to be vastly different from the motor truck in general by reason of the totally different requirements, but it can advantageously be far more like the truck in petty detail; the sort of detail that gives trouble and annoyance of a petty character.

For example, it is only in a very few instances that accessibility has been given any consideration whatever in tractor design. Control rods and bell crank connections are wrapped around each other and mixed up till it becomes quite a task to follow the linkage, carbureters are buried deep in a mass of moving parts, magnetos without covers and of non-waterproof type are employed, clutches which have less work to do than a motor truck clutch are made with expanding segments and a conglomeration of levers and cams that make adjustment vastly difficult; instead of grease cups there are exposed oil holes to collect grit and waste lubricant. It would be possible to continue the list indefinitely, but enough has been said to indicate the sort of way in which automobile experience can be brought helpfully to bear on tractor design.

The automobile was first built up, feature being added to feature as the need became apparent. Then followed a period of unification and simplification. It is this last that the tractor needs more than anything else to make it a finished machine instead of a half-finished one.

Develop Machine First

This criticism of things as they are is not intended to be destructive. It is necessary to develop a machine first and simplify it afterwards. At present the tractor has reached a stage where it is ready for the simplification process to begin, and in isolated instances it already is beginning. Let it not be forgotten that the more like an automobile in its detail the tractor becomes the easier will the farmer be able to care for it. The American farmer knows his automobile, knows how to use it and how to look after it. Therefore, whenever a *detail* of automobile practice can be turned to account it is wise to employ it.

Major Problems of Design

Sounding the other note, it must also be remembered that automobile experience is practically of very little use in settling the *major* points of design. For the power plant the requirements of the motor boat or even the aeroplane come much closer to the tractor requirements than do those for any sort of road vehicle; the tractor calls for full power all the time, full power for hours or even days on end. This means that in the engine a larger factor of safety is necessary throughout. We cannot safely use the same unit pressures that are correct for a motor truck, and we cannot, of course, look for the skilled attention that enables the aviation engine to keep its capacity for long runs. Likewise the boat motor does not supply an exact parallel, for there is little need to limit the weight or size of the water-borne engine.

There is a school of tractor engineering which believes that none of these examples is anywhere near the proper tractor type, and this is the school which has taken the stationary gas engine as a basis for developing the tractor engine. The automobile engineer is instinctively prejudiced against very large cylinders and heavy, slow-moving parts, so an automobile engineer's criticism may be discounted a little, but is it not true that the prejudice against the stationary engine type is well founded?

Modern Engine Tendencies

Go back a little way in automobile history and we see the gas engine type strongly supported, we see Olds, Reo, Cadillac and many others pinning their faith to a huge single or twin cylinder; earlier yet, and Benz, Daimler and many others are found.

Now what was it that experience taught? It taught that the massive engine "built on conservative and well-tried lines" was *not* the most reliable or most satisfactory type. It was the superior qualities of the vertical multi-cylinder engine which caused the abandonment of the large cylinder idea for automobiles. Even in the stationary engine field there is a strong tendency toward more cylinders of smaller size. The most modern engines of the leading German Diesel makers have had many vertical cylinders, because they gave less trouble; in England the high speed gas engine has been developed in recent years and has taken much from automobile practice. The automobile engine, the engine of the motor truck, the tractor or the aeroplane, is working under far more strenuous conditions than any stationary engine. It was this fact that has led to the elimination of the old type for use on vehicles; it simply was not up to the demands of the service. Thus it is perfectly reasonable to assume that the old type will be still less able to cope with the heavy demands of tractor service than it was with the demands of the passenger car and truck to which it proved unequal.

No doubt this view will be strongly combated in many places, but it is a view that is shared by many in the tractor business, where the impression is strong that those who are fighting against the so-called automobile type of tractor engine are digging a pit for themselves and will soon find it necessary to climb out and start afresh.

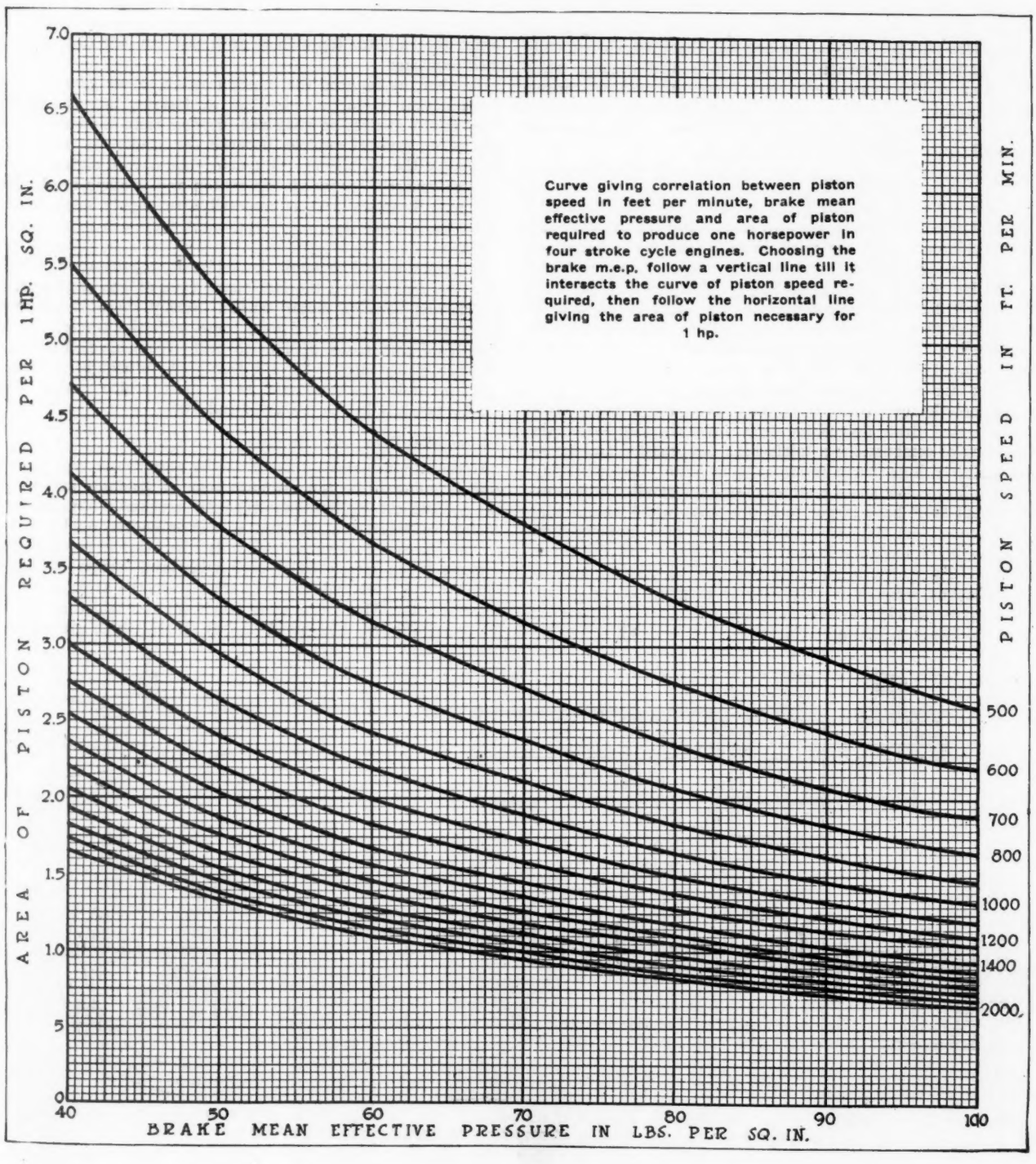
Determining Engine Size Necessary

To settle the proper size of engine for a tractor is very difficult. It is a matter of experience, and experience is not too plentiful. There is one way and only one way to figure it successfully and that is to start at the drawbar, taking the pull required and the speed of pulling as the fundamentals.

Then comes the efficiency of the machine and last the engine power necessary to give the required pull via the transmission. Having settled this there come the matters of piston speed and the best mean effective pressure, to be considered.

Now, there is no close agreement as to the proper drawbar pull or horsepower. It may be reckoned conveniently on the basis of plows to pull. For one plow the average pull required is not a safe basis for calculation unless that average is taken from a vast number of experiments. It varies greatly with the sort of soil and the condition of the soil and, of course, the depth of plowing. Now, there is not yet agreement as to the tractive effort that should be provided per plow, nor as to the best speed for plowing. A pull of 1000 lb. is apparently enough to take a plow through anything, and half or less than half this is sufficient under easy conditions. As to speed, 2 to 2½ m.p.h. is the rule, but the machines that exceed this speed certainly appear to have a more pulverizing action upon the soil. However, if we assume 2½ m.p.h. as the best speed, and take a mean value of 700 lb. as the tractive effort that should be available per plow at this speed, the results of calculations on these premises will not be far from the truth. Reducing the speed and traction to horsepower units, this means that the drawbar horsepower per plow allowed in the design should not be less than 4.7 or, say, 5 hp.

Now comes the efficiency of the transmission and the ma-



chine as a vehicle; gearing efficiency and power taken to propel the machine. Naturally this can vary greatly, but several of the most prominent manufacturers are content to take the drawbar horsepower as equaling half the brake horsepower at the flywheel. Some estimate less than half and others a trifle more. Taking the exact 50 per cent as the loss between flywheel and drawbar this gives us as a necessary allowance 10 b.h.p. of engine per plow.

Supposing this serves as a basic point from which to start the engine design we have next to decide the best piston speed and brake mean effective pressure. For motor truck engines the old formula $Hp = \frac{N\ D^2}{2.5}$ still holds fairly true. The formula assumes a piston speed of 1000 ft. per min. and a brake mean effective pressure of approximately 67 lb. per sq. in. If we raise either speed or pressure the weight can be reduced and the cost can be cut, but there are corresponding drawbacks. Increased speed means still greater gear reduction and lower gear efficiency; increased pressure means more liability to ignition trouble and more rapid carbonization. The reverse is, of course, true if speed or pressure be lowered, but weight and cost increase.

Some Weight an Essential

Obviously it is possible to guess at it and hope to strike the best mean, but there are still some other factors that can be considered. First we must have a certain amount of weight, so there is no object in trimming the engine weight to the last ounce. Second, the higher the pressure the more "delicate" does the engine become, the more susceptible is the power to small imperfections in the valves, ignition or carburetion. Third, if the pressure or speed are above a certain amount pressure lubrication is essential.

These are three reasons against high pressures or high speed, now let us turn to the other side of the picture. Here we see that first, decreasing the pressure decreases the efficiency of combustion; a fairly high compression and consequent fairly high mean pressure give better fuel efficiency. Second, large slow speed engines may have smaller unit pressures, but must have larger total pressures which means that the force of each explosion becomes more of a hammer blow and so causes more shock to the engine parts and the transmission. Third, the large engine occupies a greater amount of space and when it is necessary to overhaul it, or scrape out carbon, which must be done periodically, the operation is a far more serious undertaking.

Altogether it is hardly surprising that tractor engineers have found it impossible to agree completely as to exactly where the happy mean lies.

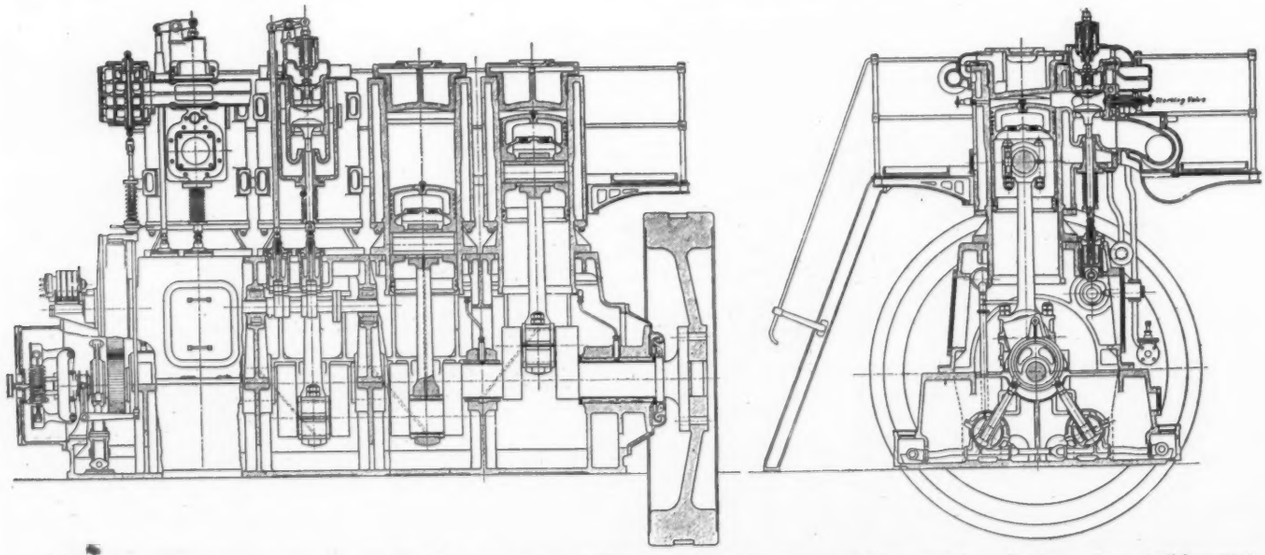
There is one thing that can be stated positively, however. It is based on motor vehicle experience admittedly, but that does not weaken the argument, and this is that engines with less than four cylinders ought not to be considered. Even if the stationary gas engine type of power plant is chosen it ought to have four cylinders as the low limit. This is because the vibration from any lesser number is destructive. With a stationary engine, on a massive bed set deep in concrete, vibration can be combated, and in driving by belt vibration in the engine is not transmitted to the machine driven, but on a vehicle engine vibration *must* pass through every portion of the machine before it can finally be absorbed by the ground. It is possible to observe tractors to-day in which the radiator top swings an inch from side to side with each explosion.

Further, as regards the punch applied to the gears in the transmission by large individual explosions, this is greater than might at first be imagined, greater than it would be on any other type of vehicle, because the tractor is positively driven by the explosions. A tractor has not an eighth of an inch of "coast"; throw off the switch and it stops dead with a bump. Practically it is impossible to supply enough flywheel to do more than carry the crank from one explosion to the next.

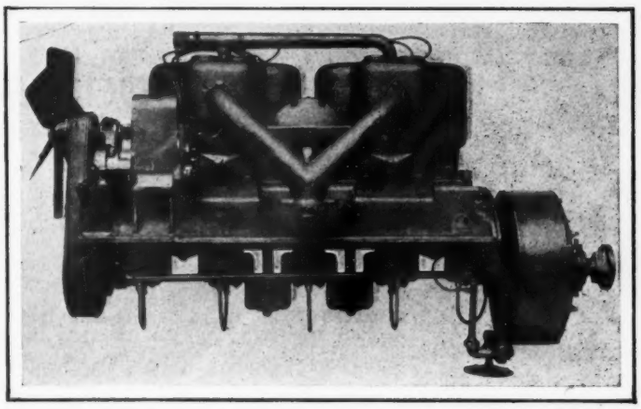
We have passed through the selfsame arguments and theories for and against the stationary type of gas engine with the development of motor trucks. Surely there is no need to go over all the ground once more with the tractor. It is often said that a son dislikes to profit from his father's experience, preferring to have a free hand to acquire his own, but life to-day is conducted at a speed which makes this hardly possible in the walks of industry.

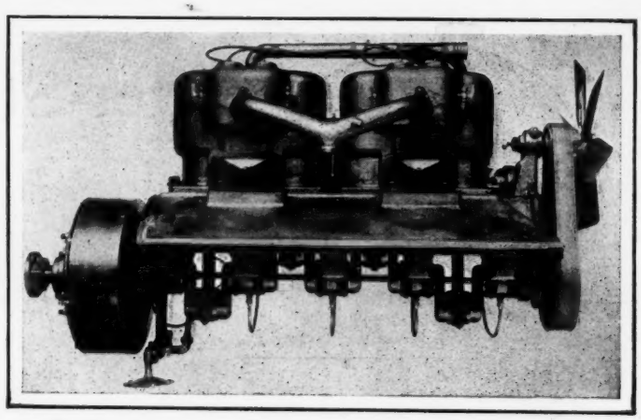
Automobile Type the Ultimate

It is therefore safe to say that the automobile type of engine is going to be the ultimate type of tractors just as it has become the conventional type for trucks. If this be admitted, consideration of what a tractor engine ought to be can be narrowed down considerably. In brief it needs to be a large truck motor which will withstand usage a trifle rougher and more arduous than that given the average truck power plant. There are some truck engines which are perfectly suitable for tractor work, but others which are not, so



This is not a tractor engine but a new British gas engine of 900 hp. with 17 in. bore and 20 in. stroke. It shows in a striking way how automobile practice is being adopted for stationary engines of the larger sort





Engine of the J. I. Case Plow Co. tractor. This is a particularly rugged example of tractor motor based upon the automobile type

one might say that the very best of truck motors is what the average of tractor engines ought to be.

One thing cannot be stated too strongly, and this is the need for protection against dust, mud and water. The tractor engine operates under the worst possible conditions. Either the whole tractor is hidden in a fog of dust, or it is splashed with mud inches thick. It stands unprotected by covering, in rain and snow, it will be utterly neglected for a month and then called upon to do full work immediately. The tractor engine ought to be capable of being buried in slime at the bottom of a pond for a month and then dug up and put straight to work without any overhaul.

A side issue suggested by this consideration brings up a point where the tractor should not follow automobile practice. The engine should be under a hood, of course, but the radiator should *not* be the front end of the hood. The radiator should be separate, standing out somewhere in front so that it will be exposed to all the winds that blow, and the fan can be outside with the radiator. The engine should be boxed in so that the only communications it has with the outside are the carbureter air intake and the exhaust pipe. There might just as well be no hood at all as a hood with a fan to blow dust into it. This has always been an absurdity in passenger car and truck construction; it is far worse than absurd on a tractor.

As regards details, any engine that is running at full power 100 per cent of the time is placing a severe stress upon the valves and the ignition, particularly upon the spark plugs. Spark plug trouble is the main difficulty against which tractor engineers are contending at present, and it is intensified by the high temperatures produced by using kerosene as fuel. The answer seems to be to use the small plug now adopted for racing engines and likely to be standardized for aeroplane use. Several tractor engines are already fitted with the small plug and it is probable that more will follow.

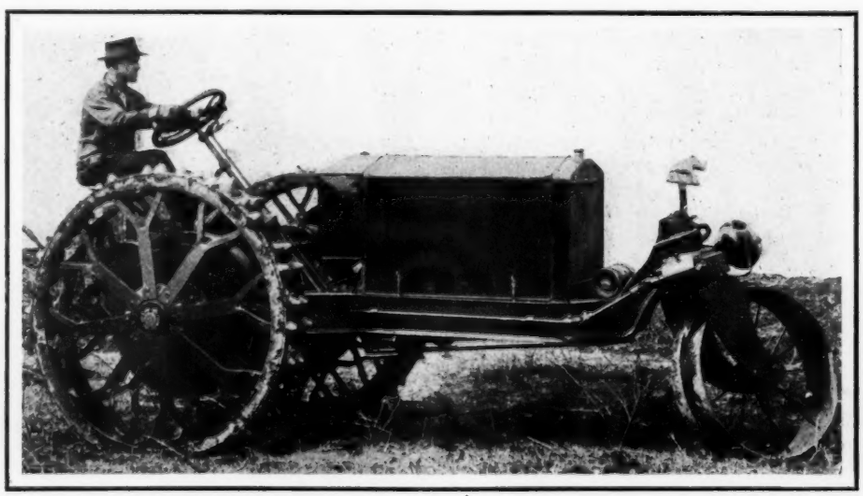
Valve areas have to be fairly large, though not very large in proportion to the cylinder size, since there is no need for high speed. Since valve trouble is always due directly or indirectly to valve temperature with an "all the time full power" engine, it is manifestly important to cool the valves as thoroughly as may be, and this suggests that it may be found advisable to use four valves per cylinder rather than two large ones. For the bigger sizes, where 60 hp. or more is wanted, a T-head cylinder with a pair of valves each side seems better engineering than any form of cylinder with two very big valves. This is just theory, it has not yet been tried out in practice, but it is worthy of note that Diesel engines, which have the severest temperature conditions of all to combat, most commonly employ multiple valves.

Since reliability, freedom from attention required and absence of parts affected by heat are three important requirements for a tractor engine there also seems some reason to think that the Knight motor would be eminently suitable. It has not been used much for trucks in America, but has been employed quite extensively in Europe and has proved extremely satisfactory for commercial vehicles. It possesses two outstanding advantages which are admitted freely by all poppet valve enthusiasts. One is there are no valves to grind or adjust, and the other advantage is that the Knight engine is far less affected by carbon deposit than any other type of gasoline engine. The writer has always been of the opinion that the admitted advantages of the Knight and other sleeve valve engines were far more important in the commercial field than in the passenger car. The chief drawback is cost, of course, but prime cost is not of prime importance when operating cost is large in proportion as it always must be.

Mastodon Tractor Ready

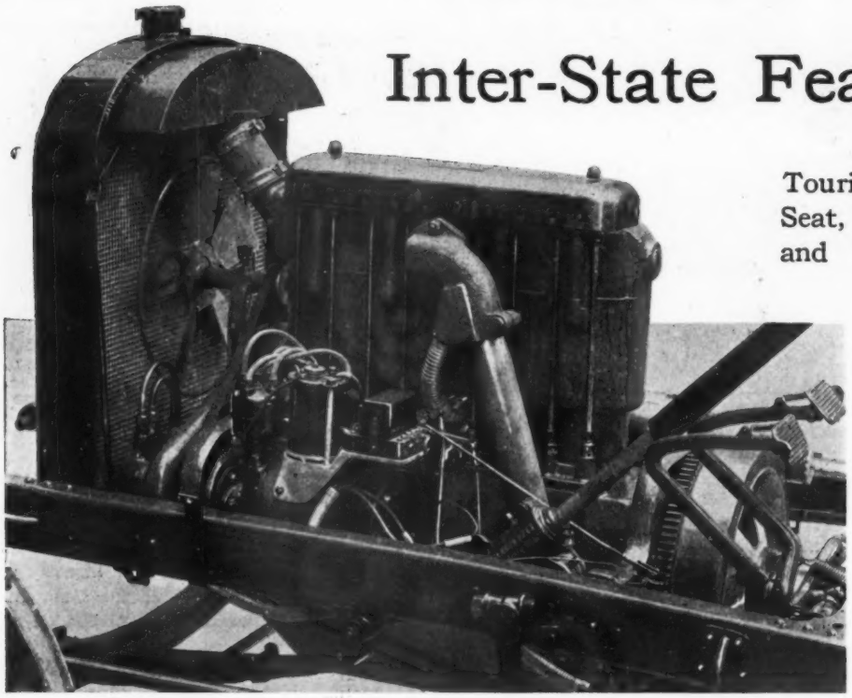
THE Mastodon tractor, made by W. E. Hosch of 2111 Olive Street, St. Louis, Mo., gets its name from the tractor wheel, which is patterned after the mastodon hoof, and it is claimed that it will travel readily over any soft or rough surface.

The machine is compactly built and every moving part is inclosed and runs in oil. Special attention is directed at the ease with which it is handled. Mr. Hosch expects to put the Mastodon tractor on the market this fall. He says that it is the result of 6 years' experimenting.



Inter-State Features Bodies

Touring Car with Divided Front Seat, Four-Passenger Roadster and De Luxe Delivery Car



Exhaust side of 3½ by 5-in. four-cylinder engine used in the 1917 Inter-State, showing mounting of lighting and ignition equipment. Overhead valves and the removable cylinder cover are features of this engine

NO mechanical changes have been made in the Inter-State for 1917, the only additions to the line being a divided front seat touring car and a four passenger roadster listed at $895. There is also a de luxe delivery car mounted on the same chassis, priced at $850.

Distinctive finish features the two new passenger bodies, the divided front seat touring car having for its standard colors a dark green body with cream wheels and the running gear finished in black. The four-passenger roadster is furnished in a gun metal gray body with battleship gray wheels and upholstered in brown Spanish leather. Both cars have the modern low, long lines and the Inter-State Motor Car Co., Muncie, Ind., has made a point of roominess and comfort in the seating arrangement.

In the five passenger divided seat job, the driver's seat can be moved backward or forward to suit the height of the driver, giving an arrangement which will be suitable for anyone to drive. As the adjustment is quickly and easily made, two people of different statures can drive the car with little inconvenience.

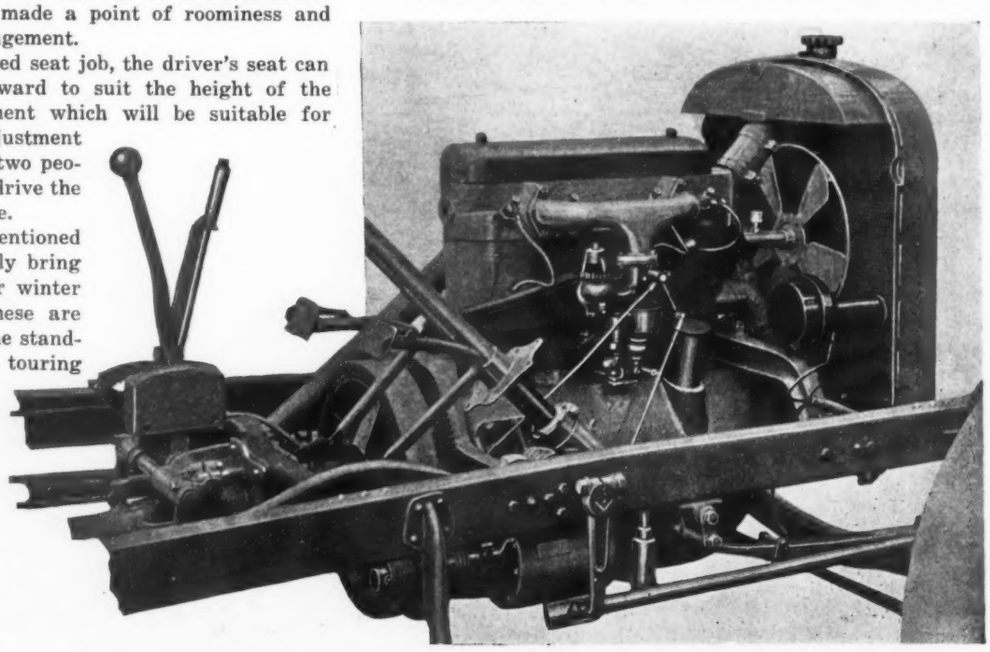
In addition to the cars mentioned the Muncie plant will shortly bring out some inclosed bodies for winter use, although details on these are not at present available. The standard series T five-passenger touring car, which is a conventional design with continuous front and rear seats, remains unchanged. It sells for $850, as does also the series TR roadster body, which is a continuation of the design of last season, except that a door has been added on top of the turtle back. This new feature permits of ready access to the large baggage compartment immediately behind the front seat and renders it possible for this space to be used without having to remove the tires. Both doors to this compartment can be securely locked and are thus rendered dust and waterproof.

Overhead-Valve Engine

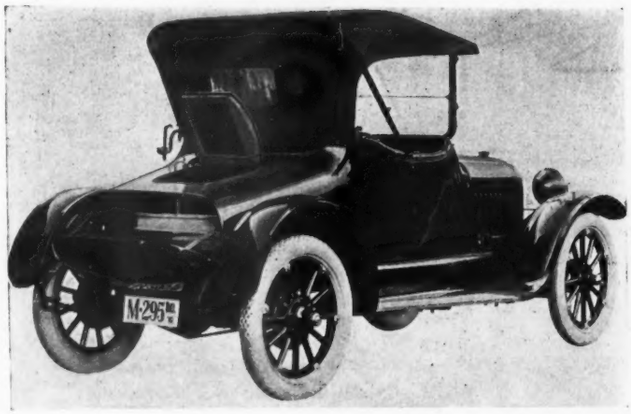
The engine is a specially-built Rutenber job, having the four cylinders cast in a single block with the valves located overhead in a removable cylinder cover. The bore is 3½ in. and the stroke 5. Drop forged I-beam connecting-rods, having a length of 9¼ in. between bearing centers, are used. The rod bearings are 2 in. in length and 1¾ in. diameter. They are lined with babbitt, as are also the bearings for the 2-in. carbon steel drop-forged crankshaft. The dimensions of the main bearings are 2 in. in diameter and 2¾ in. in length for the front, 2 in. in diameter by 2 in. in length for the center and 2 in. by 3⅜ in. in length for the rear. The bearings are steel backed with the babbitt lining accurately scraped to a finish fit.

Lubrication is by circulating splash system operated through a gear-driven pump from the camshaft. The oil is contained in the bottom pan of the crankcase, being carried by the gear pump to the bearing leads from this reservoir.

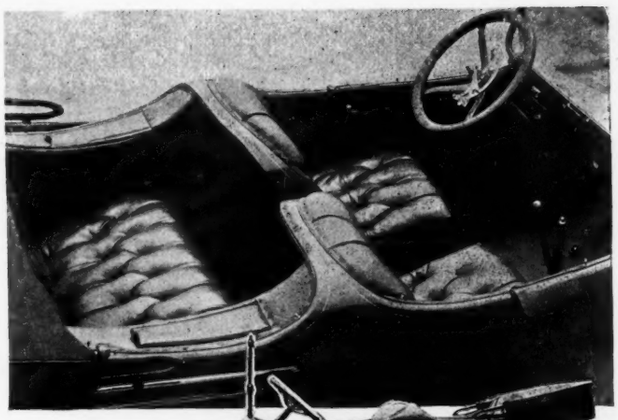
The gasoline system consists of a cowl tank and a Schebler



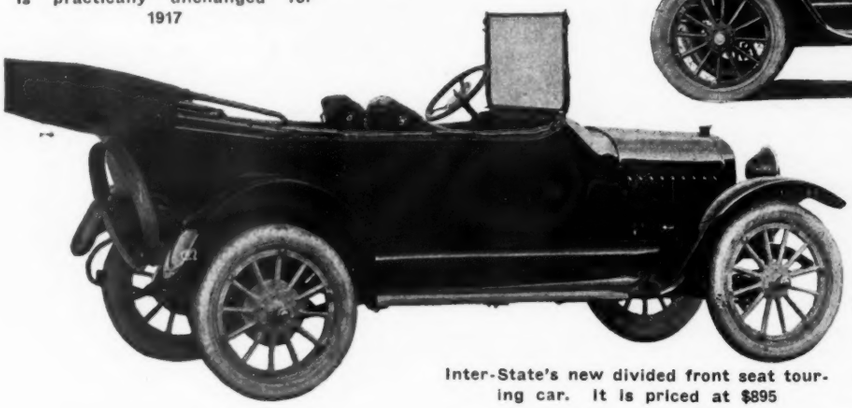
Intake side of the Inter-State engine, showing starting motor, horn and carbureter mounting



Above — Inter-State roadster, showing easy access to compartment under rear deck for tires, tools, etc. Mechanically the car is practically unchanged for 1917



Right—the new four-passenger cloverleaf roadster, showing the body contour and divided front seat

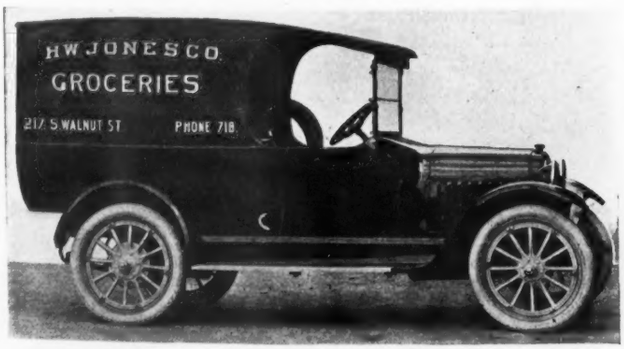


Inter-State's new divided front seat touring car. It is priced at $895

1-in. carbureter. The gasoline flow is by gravity, as sufficient hydraulic head is given by the cowl location of the tank, which is not only high, but is close to the carbureter and hence affected only to a minimum degree by variations in gradient. The gasoline gage which registers the depth of the fuel tank is mounted on the cowlboard in plain view of the operator.

Remy Electric System

Electrically the Inter-State car is Remy equipped, having this system for starting, lighting and ignition. The distributer is mounted on the left side of the motor block with the coil just behind. The ignition distributer drive is taken by bevel gears directly off the generator shaft which is connected by a flexible coupling to the same shaft which operates the oil pump. The starting motor is at the rear



New De Luxe delivery car on Inter-State chassis. It sells for $850

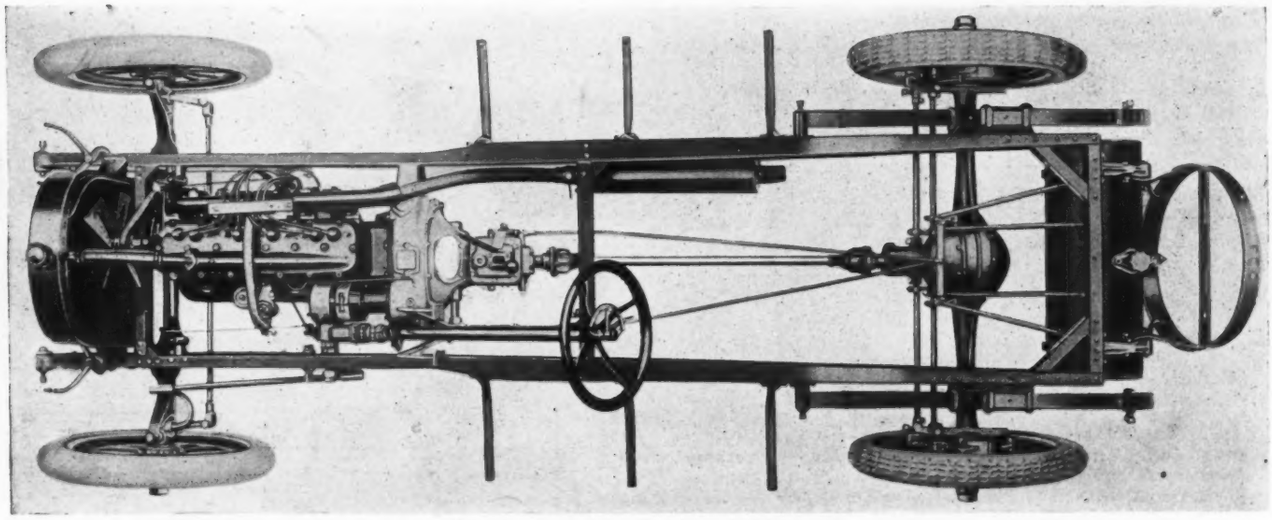
right and engages with the flywheel which is equipped with a ring gear on its forward face. The heavy wiring is inclosed in flexible metal conduits.

From the engine the drive is taken through a leather-faced cone clutch to a three-speed gearbox. There is a cross frame member just behind the clutch supporting the clutch shaft and the forward universal and torque yoke. The gearbox itself is mounted on the rear axle with the face of the box bolted directly against the rear axle housing. A direct ratio of 4 to 1 is secured through the bevel gear axle, which is supported on Hyatt roller bearings. The axle shafts are floating.

A pressed steel bottle-neck frame is used with the side channel members 3½ in. deep with a 5/32-in. section. The wheels are wood artillery type, having twelve spokes each 1⅜ in. in diameter. They are equipped with Firestone demountable rims carrying 33 by 4-in. tires and with non-skids fitted as standard equipment in the rear. Tires are Goodyear. Three-quarter elliptic rear springs are used, the length of these being 46 in. and the width 2 in. The front springs have a length of 36 in. and a width of 1¾ in.

Five Body Styles

With the additions mentioned there are at present five bodies mounted on this chassis. The standard five-passenger touring known as series T has undivided front and rear seats. The TR is the standard roadster with rear deck, having a two-passenger capacity. The TD is the divided front seat job with the adjustable driver's seat feature. Series TR four is the new four-passenger roadster and TC is the parcel delivery wagon of 800 lb. capacity. It is especially adapted for the use of florists, confectioners, clothiers and grocers. There are double doors in the rear and the loading dimensions give a width inside of the body at the top of 46 in. and at the bottom 42 in. The height is 51 in. and the length from the back of the seat to the doors is 65 in. In finishing these bodies all the fenders and dust skirts are black enameled and baked in the ovens of the Inter-State factory. Selected natural wood wheels will be furnished on any of these cars at $5 extra per set.



Paterson chassis for 1917 which is fitted with a Hess floating axle and uses the Hotchkiss type of drive

Two New Paterson Models for 1917

Four-Passenger Roadster and New Touring Design with Double Cowl—Floating Axle and Hotchkiss Drive

THE 1917 Paterson chassis, built by the W. A. Paterson Co., Flint, Mich., has a new rear system and will be fitted to a four-passenger roadster body in addition to a new design of touring car body with the popular double cowl effect. The offering of one of the so-called sociable types of roadster or close-coupled bodies is a new thing with Paterson, heretofore only the touring car body being offered. The price is $1,065 with the touring car body.

Mechanically, the only changes in the chassis, which is powered with a six-cylinder Continental engine, are the adoption of a Hess floating axle, and the use of the Hotchkiss type of drive, whereby the driveshaft back from the gearbox is open and fitted with two universal joints, and the drive and torque are taken through the rear springs, the main leaves of which are made strong enough to take on these added duties. Formerly an inclosed driveshaft with a single universal at the front end has been used, the newer construction being lighter and doubtlessly much more efficient as applied.

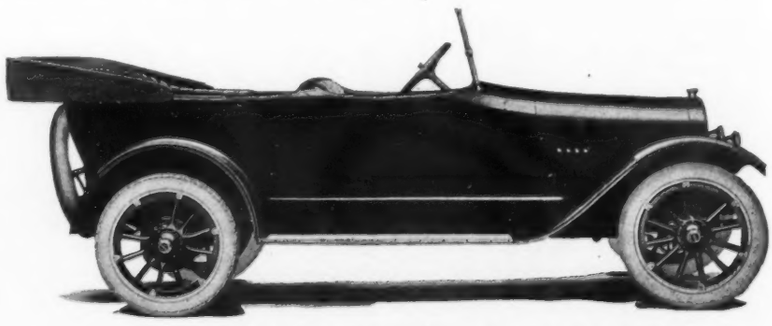
Bodies Are Larger

In the body, perhaps the most notable differences are the new lines and the wider and longer dimensions which add to the roominess of the vehicle. At the back of the front seat the double cowl idea has been meritoriously worked out in conformity with the general lines of the car, and the straightness of the lines has been accentuated by raising the radiator and hood 1½ to 2 in. As an added touch of modernity the windshield has been given a slight slant, the mistake of making the incline too great not being committed. To give more leg-room for the front seat passengers, the front seat has been moved back a few inches, and to further add to the car's comfort and good looks, the upholstery is of the type in which there are parallel plaits instead of the tufted form. Auxiliary seats to fit in the tonneau can be furnished if desired, thus giving ample room for seven should the purchaser wish to convert the car into a vehicle of larger capacity.

Standard Units Used

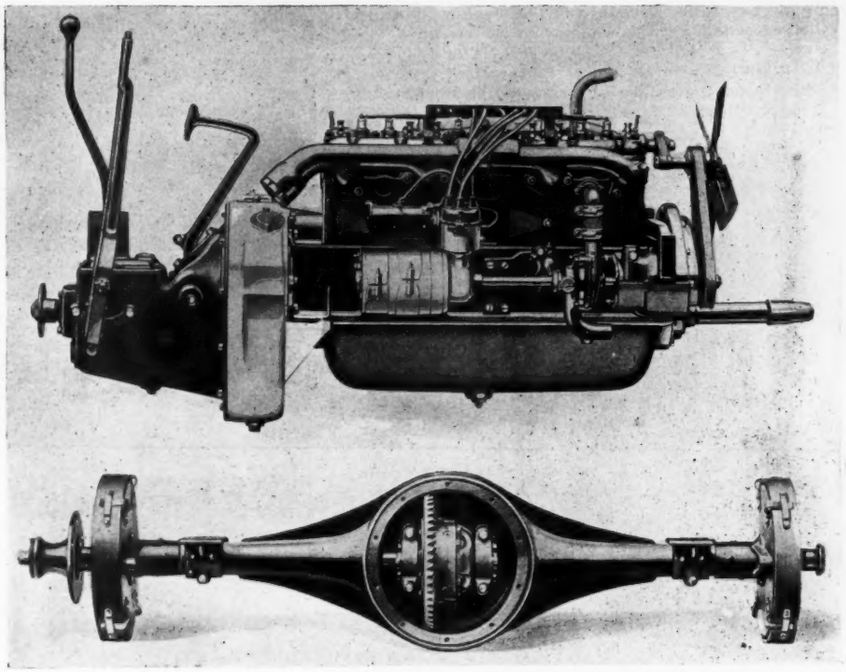
There is nothing of the radical about the Paterson car. It adheres to conventional design, utilizing standard units. A Warner gearset bolts directly to the motor to make a unit power plant, and a leather-faced cone clutch is also utilized, the action being so worked out that very little effort is necessary to press out the clutch pedal for gearshifting. The new axle is fully demountable, with a one-piece pressing, webbed outwardly, serving for the deffefential housing and the axle tubes as well. It is fitted with spiral-bevel driving gears, the advantage of which is now too well known to be needful of further discussion here. Springs are three-quarter elliptic in the rear, and attached to the rear member of the frame is a large gasoline tank that supplies its fuel to the carbureter through the Stewart vacuum feed system. Tires are 32 by 4 on demountable rims, with the rear pair provided with non-skid treads, and the wheelbase for either body model is 117 in.

Electrically, the car is Delco, employing separate starting and lighting units, with the ignition distributer mounted at the forward end of the generator. The new type of Stromberg carbureter is fitted.



New Paterson touring car with double cowl. It sells for $1,065

It is not necessary to go into a detailed description of the 3¼-in. by 4½-in. Continental engine. It might be said, however, that the cylinders and upper half of the crankshaft are cast in one piece, with the cylinder head detachable as a unit. Valves, exhaust manifold, water pump and electric unit are all on the right, which leaves the left side exceptionally clean. In fact, nothing is carried on this side with the exception of the carbureter, this bolting directly to the casting, well up in the center. Distribution of the incoming gases to the several intake ports is done within the casting itself, affording excellent heating of the incoming gases and eliminating the necessity for an elaborate jacket arrangement for the carbureter.



Six-cylinder Continental engine, which forms a unit power plant with the Warner gearbox, and the new Hess floating axle used in the 1917 Paterson

Solid Engine Support

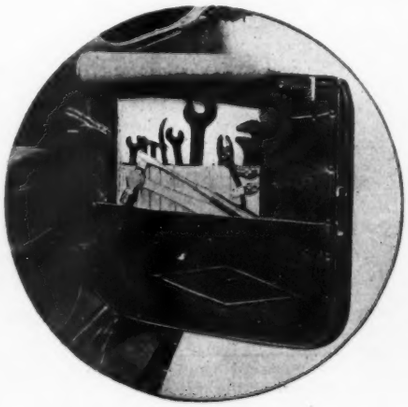
Suspension of this engine in the frame is by means of arms extending out from the flywheel housing at the rear, and by hanging the front end of the crankcase from a forged cross-member which is bowed upward to allow the forward end of the motor casting to pass beneath it. Thus, while a three-point suspension in the accepted sense is not used, its advantages are obtained, and at the same time the engine is very solidly carried.

Three-Bearing Crankshaft

Three bearings carry the crankshaft, and three more are employed for the camshaft. On both sides of the front bearing of the mainshaft there are flanges which take any end thrust which may be imparted to the shaft by the clutch or other outside mechanism. This is a precaution against untrue running of the shaft and consequent noises. Bearings are of nickel-babbitt, being bronze-backed, and as this material is a good conductor of heat, it aids materially in keeping the bearings cool. A plunger pump feeds oil through copper tubes within the crankcase direct to the main bearings, and also to the helically-cut timing gears housed at the front.

Nothing unusual is presented in the pistons nor in the connecting-rods, both being sturdily built, and that set which goes into any particular motor is accurately weighed so that each piston and rod assembly is of the same weight as the rest, a big factor in reducing vibration and consequent smooth running.

The pump and generator shaft on the right is also utilized to drive the fan, through a flat belt connection. The fan is a four-bladed pressed-steel affair, supported by a rocking bracket which seats in a hole cast in the front end of the cylinder head plate. Moving this bracket up or down takes care of the belt tension as required. The centrifugal water pump is located ahead of the generator unit, and it delivers the water to a single opening into the cylinder block, which is directly above the pump, thereby reducing the length of the supply pipe to the minimum and making it a straight passage. The distribution of the water within the packets is arranged so that each cylinder gets amply cooled.



Tool compartment in the left front door of the new Paterson touring car. Each tool has a pocket and the flap protects the compartment from the weather. This arrangement makes it easy to keep track of the various tools and does away with groping under the seat for them

Chassis Is Lighter

Due to the use of the open type of driveshaft without torque members of any sort, the chassis is materially lightened, and is brought up to most modern of engineering ideas. Besides the driveshaft, the only rods running back from the forward part are the two brake rods controlling the two sets of brakes. The equilizers for these are placed on the rear axle housing, with brake control rods just ahead of the axle tubes.

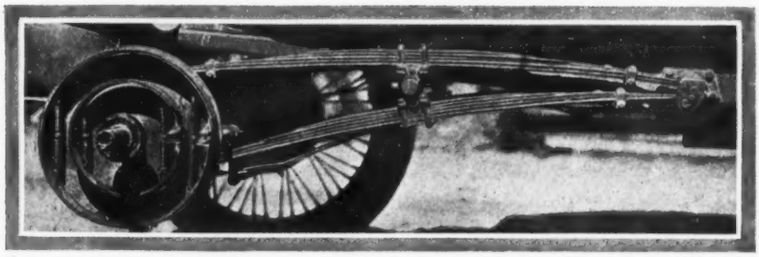
A slight taper is given the frame from back to front so as to properly support the body throughout its length. Yet while this frame is very sturdy, being especially strengthened by wider flanges at its center, it is quite light, and indicates that much engineering skill has been put on its layout. There is a single cross member besides strengthening given by the engine at the front and the use of a strong member at the rear. This intermediate member is located at about the center of frame length, where it is obviously of most advantage. Attached to the rear member are brackets which serve the double purpose of supporting the gasoline tank and holding the spare tire and rim carrier.

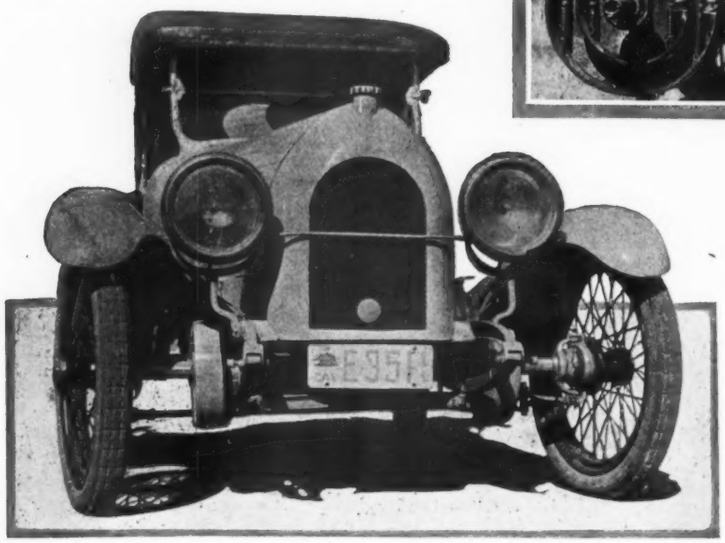
Equipment Is Complete

The car is equipped with Stewart speedometer, extra rim, full tool set, one-man top, attractive universal-acting windshield, quick adjustable side curtains, and Willard storage battery. In connection with the tool equipment, special attention should be drawn to the handy arrangement of these necessities in a compartment in the left front door, close to the driver's hand. Here each tool has its own pocket, and the arrangement is an incentive to keep the tools where they belong.

Below—Front view of the Homer Laughlin eight-cylinder roadster, showing stream lines. Note drive chain housings on front axle

Right—Double cantilever rear springs used on Homer Laughlin eight, showing also brake construction





Homer Laughlin Light Eight

Front Drive by Chains to Jackshaft, Friction Transmission and Double Cantilever Rear Springs Are Featured

AN eight-cylinder light roadster will be the 1917 offering of the Homer Laughlin Engineers Corp., Los Angeles, Cal., which is that city's only passenger car factory.

For more than 2 years the engineers of the corporation have been working on the car which has been placed on the market to sell at $1,050. The car is known as the Homer Laughlin eight. It is a front-drive creation equipped with a 25-hp. engine, designed and built at the Los Angeles factory of the company. The car has a friction transmission.

10,000 Miles in Tests

Three experimental models were put out by the new factory before the engineers were satisfied. After the third model had been driven approximately 10,000 miles in tests, all over the California and Arizona deserts and through the Sierra Nevada mountains, the car was pronounced finished and the factory began building cars for the market.

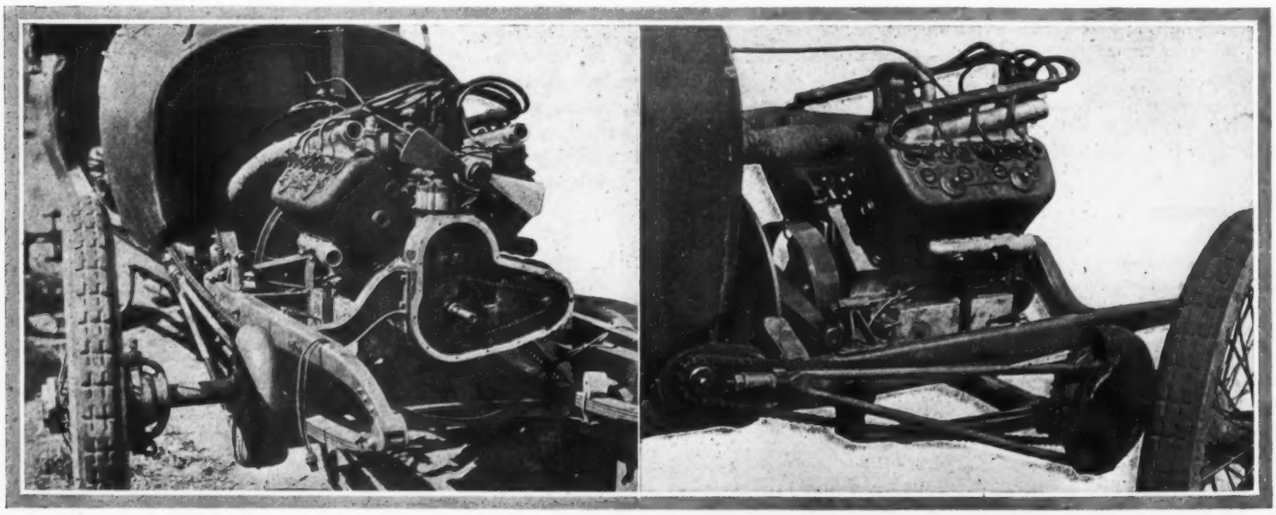
There are a number of sterling features incorporated in the construction of the Homer Laughlin eight. The body design is attractive, and on account of the dual spring arrangement, the car is one of the easiest riding machines to be found.

Front Drive by Chains

The front wheels are driven by means of chains rigged from sprockets on a jackshaft to sprockets on the front axle. The power is transmitted out to the wheels through patented universal joints which make the car extremely easy to steer, and it is impossible to lock the wheels. The drive chains are incased in a light metal housing and these are taken up or let out by means of set-screws which work on the jackshaft sprockets, leaving the front axles always in line.

Friction Transmission Features

The friction drive clutch is released by pushing down on the pedal and engaged by letting it in, like an ordinary gasoline car clutch. A powerful spring holds the drive against the disk and by releasing the spring, the clutch is released.



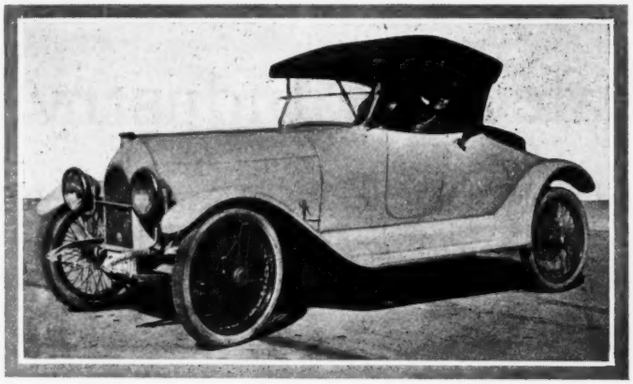
Front and side views of the eight-cylinder engine used in the Homer Laughlin roadster. These views also show the two-bladed fan, chain-driven timing gears and the front-drive assembly. Note the set screw arrangement from frame to axle sprocket. The patent universal joint used is visible in the illustration at the left

The friction disk is made of a composition which the engineers worked out with the intention of using it for friction disk purposes, and it is proving highly successful in the cars now in operation.

Factory Is Well Equipped

As soon as new machinery is installed the factory will have a capacity of 50 cars a month and the factory has many orders booked ahead so that the plant will be worked overtime to keep up with the demand which is not entirely local.

At the company's factory there is equipment for every kind of casting and all the machine work necessary on the cars. In the past no passenger cars have been built in Los Angeles except special models assembled in that city for racing purpoes; but the Homer Laughlin is to be built entirely in Los Angeles with the exception of the wire wheels, which are built to order by the Houck company.



Side view of the Homer Laughlin eight-cylinder roadster which sells for $1,050

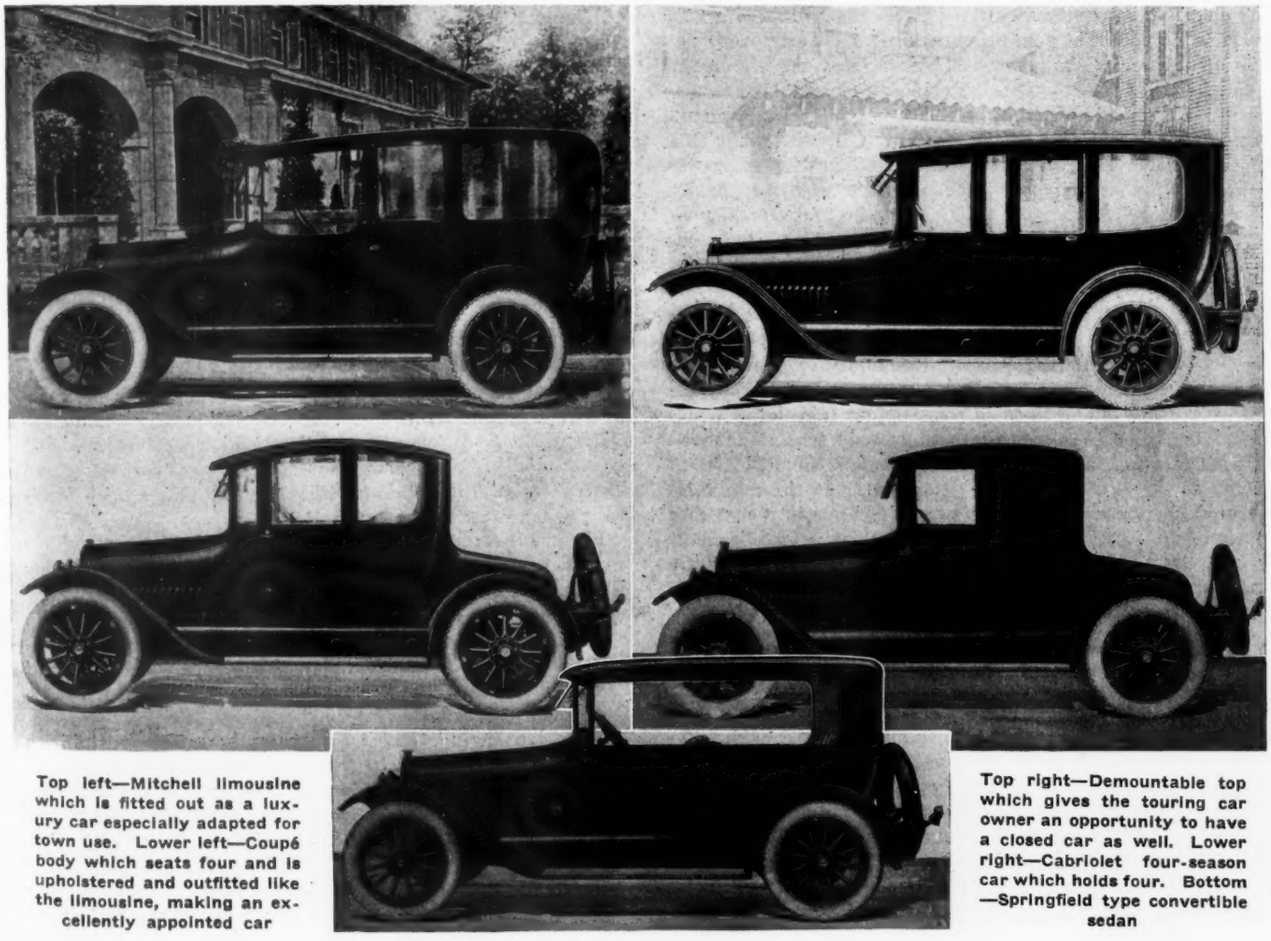
Smart Four-Season Bodies for Mitchell Chassis

THE Mitchell line of Four-Season bodies is now out and shows very clearly the trend toward bodies that can be used at all times of the year in all kinds of weather. The sedan is an especially attractive job, being a Springfield type, finished and upholstered like a high-class limousine, but with the seats all inside, so that the driver is with the other members of the party, making an ideal family car. The plate glass sides completely disappear when so desired, transforming the car into a touring design with a permanent top.

Another attractive design is the cabriolet, which should prove very popular with physicians. It has room for three passengers and an auxiliary seat for a fourth. With the top up, it is a coupé, and with the top down, a roadster. In transforming the car into a roadster, the top drops back and the side windows drop down into the doors.

For a luxury car there is the limousine which is all finished in whipcord with silk drop curtains. There are three electric lights, telephone, toilet and vanity case, flower vases, smoking sets, Waltham clock arm rests and seats that can be made to face any way.

In addition to these bodies, there is a coupé and also a demountable top that can be attached to the touring body.



Top left—Mitchell limousine which is fitted out as a luxury car especially adapted for town use. Lower left—Coupé body which seats four and is upholstered and outfitted like the limousine, making an excellently appointed car

Top right—Demountable top which gives the touring car owner an opportunity to have a closed car as well. Lower right—Cabriolet four-season car which holds four. Bottom—Springfield type convertible sedan

Effect on Industry of Standard Truck

Military Requirements in England Raise Problems of Expediency—Commercial Drawbacks Observed in Military Standard Design Made by Different Manufacturers

THE view has recently been expressed in England that the best way to get British trucks for the army is to have a standard design or series of designs and to force different automobile firms to make different parts, assembling the vehicles in some other factory. *Motor Traction* (England) makes an editorial comment on the proposal which is worthy of note in America, for similar conditions might possibly arise here, should the government decide to buy very large quantities of vehicles.

First, this editorial states that there is little doubt as to the advantage of the scheme, solely from the military viewpoint. The army would like to have all its trucks alike without variation, and is quite right in its desire to have them so, provided that there is no weak spot in the design chosen. The matter which concerns our contemporary is the effect upon the markets of the world of the existence of large numbers of these trucks for which no one firm is responsible, especially supposing that they are thrown on the used car market, as they are practically certain to be sooner or later.

The editorial continues:

"The effects of any such assembly scheme, assuming that the vehicles put together will go into a country where a very considerable potential peace-time market exists, are very difficult to assess. Viewing such schemes from the standpoint of the British industry, it is undoubtedly desirable that new and growing markets should be fed from this country in the first instance, and the goodwill connected with them thus prevented from slipping out of our hands. Very much depends on whether the cars provided as a result of official initiative prove thoroughly satisfactory in use. If they do, they will act as a useful advertisement for British industry. If, on the other hand, they are not uniformly satisfactory, harm may be done to our national reputation as motor engineers. It is always a difficult matter to design a complete chassis which will give good results without undergoing a long period of preliminary trial. The difficulty is increased when the designers have their hands more or less tied by the need of working along lines to some extent laid down in advance. It may be presumed that in any such scheme now under consideration, an endeavor will be made to utilize components readily available rather than to force the manufacturers of components to adopt new designs possibly entailing the use of fresh machine tools. Past experience, in this country and elsewhere, does not inspire very rosy hopes of the ideal character of any assembled machine, much less one assembled under such considerable difficulties.

After the War

"If, however, we take it that the endeavor to produce a satisfactory type of assembled vehicle will be successful, we have next to consider what will happen if a considerable number of these vehicles remain available for general service after the war. The official scheme of assembly would presumably only be temporary, and would not be perpetuated in competition with recognized manufacturers. The vehicles remaining on the road might or might not be retained in government service by our allies. If so retained, no doubt a considerable store of spare parts would be available from the first, and adequate arrangements would be made for the provision of further supplies of such parts whenever they might be required. If, on the other hand, allied governments were to dispose of their vehicles to traders and others when the war is over, it is quite conceivable that the time would arrive when the owners of the machines would find themselves in difficulties with regard to spares and renewals. It would be very awkward for a user to have to apply to one manufacturer for engine parts, to a second for steering gear parts, to a third for back axle parts, and so on. Consequently, it would be necessary that somewhere or other a large stock of spares should be kept in existence, until the number of official type vehicles remaining in service had become quite negligible. Without such precautions, the most well-intentioned effort to supply, by the creation of assembled cars, from this country rather than from abroad would cause more harm than good to British industry in the long run. We have never had a very great reputation for watching the interests of users of British machines in distant countries, and if we are to extend our markets effectively to absorb our much increased output, we have got to show general improvement with regard to service of this kind.

"On the whole, the arguments in favor of the temporary adoption of some assembly scheme under official auspices seem to be fairly strong, but so also are the arguments against it. If the real object of such a scheme is to be primarily to advance the interests of the British industry, and not merely to provide useful experience for a few favored individuals, there are numerous precautions which must necessarily be taken in good time. Given these precautions, no great harm may result, but on the whole we cannot express ourselves enamored of the principle involved in the creation of what might be called the national assembly chassis."

Compressed Coal Gas for Trucks

Comment has recently been made on the effects of gasoline shortage in England on the stimulation of kerosene experimentation. Another suggestion which emanates from France is to use coal gas compressed in steel cylinders, and anent this the *Motor Trader* (England) makes a very interesting comment as follows:

"Persons in touch with the self-propelled street vehicle movement of the early and middle "eighties" of last century will remember the attempts to adapt coal-gas engines of the Otto (Crossley make) type for driving street tramcars. We believe there is a surviving example of this style of propulsion at Neath in Glamorganshire, though we can only recall one of the last attempts in that direction, namely, a tentative installation at Blackpool.

"Attention having been drawn recently to the possibilities of this form of propulsion, using compressed coal gas in cylinders easily removable for recharging and replacement, it may be useful to append some data contributed in 1913 by a French gas engineer to the Proceedings of the Institution of Gas Engineers of France.

"Owing to the exceedingly high degree of compression which the gas undergoes—over 100 atmospheres—certain of

the heavy hydrocarbons, such as benzine and its homologues, are thrown down in liquid form, thus causing a direct loss in thermal value of from 6 to 10 per cent. Taking the average price of gasoline at 42 cents per gal., its calorific power being about 140,000 B.t.u., it is seen that approximately 80,000 B.t.u. are obtained for 24 cents. On the other hand, assuming the average calorific value of the compressed gas to be about 480 B.t.u. per cu. ft., with this selling at 72 cents per 1000 cu. ft., including compression, the thermal units obtained for 26 cents would be 160,000. It is suggested that ten gas cylinders could be carried on each vehicle, these being 6 ft. 6 in. long by 8 in. in diameter, and involving a dead weight of about ¾ ton. Between them they would carry about 2500 cu. ft. of gas, or the equivalent of about 11 gal. of gasoline in the case of gas as obtainable in Paris.

"It may be inferred from these figures that the prospects of coal gas are not great for vehicle use, and that without reference to the effect to be anticipated from substituting a calorific for a lighting standard of efficiency, as recently sanctioned by Parliament."

Westcott Adds Springfield Touring-Sedan Body

THOUGH built under the Springfield patent, many improvements have been incorporated in the new Westcott Touring-Sedan body. The only windows that it is necessary to entirely remove are those at the sides of the rear seats, as the others telescope into the sides of the body. There they are completely hidden. The pillars, too, fold down and are concealed in a similar manner.

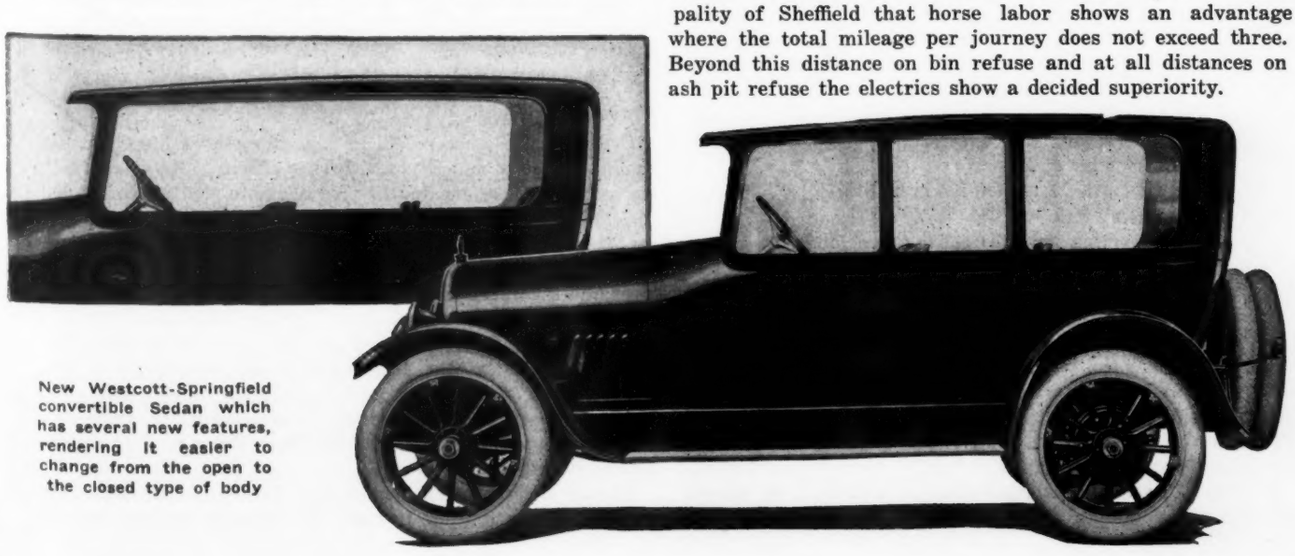
The windows at the sides of the rear seat, however, may be dropped three-quarters of the way into the sides of the car for the purpose of ventilation, and the other windows may be lowered to any desired point.

This body type is built on the standard 125-in. wheelbase chassis. This has a Continental 3½ by 5¼-in. motor with an S. A. E. rating of 29.4 hp. A Fedder's radiator with thermostatic control comprises the cooling system, the latter tending to better the performance of the motor. A few of the other specifications of this model include a two-unit Delco system, Spicer universal joints and Timken axles and bearings. The rear springs are made from chrome-vanadium steel and are of the cantilever type.

The aisle between the front seats has been widened to 9 in., and the rear seats have been made correspondingly wider. The rear seats now measure 50 in., instead of 47, as was the practise last year. The generous leg-room, both in the front and rear compartments, has been maintained, and the cars are more attractive than heretofore.

It is predicted that this season will see a considerable improvement in the all-season and all-weather types of bodies, as the trend which started about three years ago has been carried through until some sort of a convertible body is incorporated in practically every line. The Westcott-Springfield types illustrated on this page show one direction that the development is taking, in that the conversion from a summer to winter type is easier made by a person who is not a mechanic.

To combine the utility of the convertible job with sightliness is one of the hardest tasks that confronts the designer of this type of body. This has been met very successfully in some of the newer types that are coming out this season. The Westcott bodies have some of these developments, as they have been worked out in their own plant, and the improvement is marked. The prices at which these bodies are sold are also low enough to make all-year motoring more attractive than it was when it was deemed necessary to have two cars, or at least two entirely separate bodies which could be interchanged.



New Westcott-Springfield convertible Sedan which has several new features, rendering it easier to change from the open to the closed type of body

Electrics Cheaper than Horses in Garbage Haulage

THE street-cleaning department of Sheffield, England, has found electric vehicles to be more economical than horses in hauling garbage. The cost per ton of refuse collected showed in practically every case a marked advantage on the side of the power wagon. Two vehicles have been in operation for some time. Taking a period of 22 weeks one electric vehicle working during daylight cost $1.41 per ton of refuse collected. For a corresponding time under similar conditions the cost of the horse was $1.83 per ton. For night work the cost of the electric vehicle was 56 cents per ton and for the horse 79 cents.

On the second vehicle on another kind of service the cost was $1 per ton as compared with 93 cents for the horse system, while at night on this same service the cost by electric vehicle was 25 cents per ton as against 62 cents for the horse. The tests have led to the conclusion by the municipality of Sheffield that horse labor shows an advantage where the total mileage per journey does not exceed three. Beyond this distance on bin refuse and at all distances on ash pit refuse the electrics show a decided superiority.

Truck and Tractor Engines—Part II

Establishing a Rational Basis for Motor Application—Details of Design of Crankshafts, Valves, Bearings, Flywheels, Connecting-Rods, Camshafts and Pistons

By H. L. Horning
Engineer and General Manager Waukesha Motor Co.

MANY formulas have been put forth for establishing a rational basis for motor application based on M.E.P. obtainable in engines and many attempts to use these formulas up to this time have failed because there are so many variables and designers have had little experience in applying them. American conditions vary so much, as quantity manufacture dictating standard models in trucks to cover a wide range of conditions and make it seem advisable to hold to what has been found good practice. Engine designs and sizes have varied widely in the past; present practice finds engine design and sizes converging toward common practice.

Truck and Tractor Engine Specifications

The following specifications represent what appears to be good practice in engine design and material for trucks and tractors. This was arrived at after examination of all foreign and American specifications available for successful trucks and their engines and American practice in tractors:

Cycle—four.

Number of cylinders—four.

Cylinder type—in pair or cast in block—L head or valves in head.

The L head seems to be less sensitive to ignition troubles and most commonly used, though the valve in head has decided theoretical as well as actual points of excellence.

Material—Semi-steel.

Elements of design—Cylinder design for truck and tractor motors is mostly involved in an efficient combustion chamber, for it is here that the basic process of the motor occurs and where most defects are evident. Perhaps the difficulties may be best illustrated by stating that at full load and with poor fuel such difficulties as compression pound, cracking of fuel, steaming of waterjacket and pre-ignition occurs. A typical case may be cited of a pleasure car engine, by means of a preheated intake manifold, burning either a poor fuel or kerosene and delivering full load. But under these conditions the following bad symptoms occur:

(1) The exhaust is not clear, being light-colored or steamy.
(2) The engine is pounding excessively.
(3) The power is off at least 20 per cent.
(4) The water outlet from engine is boiling.
(5) Fuel economy bad.

A thorough examination will show the combustion chamber as having a hot spot—most likely a valve plug, a spark plug or a part in the neighborhood of the exhaust valve.

It is important to remember that 70 per cent of the heat loss to jacket water occurs in the neighborhood of the exhaust. To locate the offending spot it is well to start with valve plug, and a very striking demonstration will occur if this is causing the difficulty.

With an oil can keep the plug under water so that it will boil violently and cool the spit.

In about 30 sec. the exhaust changes and becomes almost invisible, the pounding stops and the power-output goes up, the magneto can be slightly advanced. Economy improves and the outlet water ceases to boil.

As nearly as we can tell, this is what happens:

1—The hottest spots have been so cooled that cracking of the fuel which comes in immediate contact with the spot has stopped, as indicated by the clearing of the exhaust.

2—The spot has so cooled that circulation water can come in contact with the walls nearest with the resultant proper dissipation of heat.

3—Pre-ignition has ceased, because the temperature of the hottest spot has been brought below ignition temperature.

If now we cease cooling the hot plug all the old processes will have gone through various stages of development in about 2 min. and the engine will start working as at first, which proves conclusively the source and cause of the difficulties. If the hot spot be a valve or the center of a piston, it can be ascertained by the color of the metal toward the center.

Generally speaking, we have recalled by this demonstration the following principles:

1—The maximum temperature of any spot in the cylinder must be kept below the pre-ignition point.

2—The maximum temperature of any spot in the cylinder must be kept below the cracking point of any part of the fuel.

3—Any one spot will determine the performance of the engine.

4—That one spot capable of cracking fuel or pre-ignition spreads over an area and causes so-called steam pockets in the circulation which further extends the disturbance in the performance.

5—Economy of fuel consumption is established by a high average temperature of combustion chamber walls.

6—The limit of practical compression, hence power, output, economy and of fuel quality which can be successfully burned is established by a high average temperature of the combustion chamber and low maximum temperature of the hottest spot.

Crankshaft Design

Crankshaft diameter 0.45 to 0.50 of cylinder diameter. It should be heavy and short with long cheeks. Material, 40-45 carbon steel; heat-treated to give ultimate strength of 90,000 to 100,000 lb. For heaviest service chrome nickel or 3½ per cent nickel steel, 0.35 carbon heat treated for ultimate strength of 140,000 lb. per square inch. These crankshaft sizes and specifications mentioned are for three-bearing shaft. Bearing lengths as follows are according to common practice: Connecting-rod bearing length may be put down as 0.65B. Making this unity, then the length of main bearing is as follows: Front end, 1.20; middle, 1.15; flywheel end, 1.50. Tabulating service experience and analyzing actual pressures the following has given better results: Front end, 1; center, 1.40; flywheel end, 1.50.

The importance of the center main bearing is illustrated by the constant attention it requires when of normal length.

Where two-bearing cranks are used, the same general specifications obtain with the exception that the shortening of engine as much as possible is desirable to develop the stiffening of the crankshaft. Inasmuch as the valves govern the engine length and that with a given lift effective valve areas vary directly as their diameter while displacement drops approximately as the cube of the diameter, shortening of the smaller sizes of motors is easily obtainable. General experience with two-bearing shafts suggests that nothing short of counter-balancing will correct the whip and lack of stiffening in shafts having common dimensions. Crankpin and main-bearing sizes should be not less than 0.70 B. The stiffness of the shaft should be conserved by attaining bearing area through the large diameter of the shaft rather than by length and by getting the greatest longitudinal thickness of cheeks possible. The connecting-rod bearings should be 0.6 B length; end cheek 0.42 thickness, while the long cheeks should be 0.6 B.

Number of Bearings

Some recent designs have gone to four and five main bearings. The four-bearing shaft should give satisfaction but make a long engine; a five-bearing shaft makes a still longer engine and robs the connecting-rod length to give length to crank bearings and have been mostly found inferior in general all-around results to a well designed three-bearing shaft. In designing the severity of service compared with usual provisions made to meet it, make the order in which bearings need attention as follows: 1, Crank pin; 2, center main; 3, flywheel end; 4, front end.

Crankshafts do not wear cylindrical, the greatest wear coming on the inside of the crankpin and on the opposite side of the main bearing. The use of alloy steel in cranks is justified only by the desire to retain the true form of journal for a reasonable length of time. Alloy steels and particularly chrome-nickel variety have shown admirable ability to withstand abrasion but, roughly speaking, the elastic limit seems to give a measure of resisting ability of the material, other things being equal.

The factor which seems to determine largely the quality of the crankshaft material is most readily expressed by the saying that "crankshafts must last in spite of the oil they are apt to get in truck and tractor service."

Notwithstanding the poor initial quality of oil that engines get, the lubricating quality is still further reduced through the rapid increase in gasoline or kerosene content covering a 10-hr. run in tractor service. Where open-type breathers were used, the writer has seen ½-in. of mud and sand in the bottom of a crankcase and has seen leaves taken out after 3 months' service. In this particular case the crank was found to have worn 0.003 average, while the cylinders wore 0.030; piston rings were worn to a knife edge and width of ring grooves to 0.030 clearance on side ring for top, 0.018 clearance for second ring and 0.005 for bottom groove. This cannot be considered a reasonable condition under which a mechanism could be expected to work, but the demands are such in tractor service that the motor that receives little damage should conditions get bad, certainly illustrates the old law of the survival of the fittest. Dust in the combustion chamber can be eliminated by various methods of dust removal, the most successful type being one made by a well known carbureter company.

Dirt in the crankcase can be kept to a minimum by the use of a check-valve breather which allows pressure to escape but checks the flow of air into the crankcase.

Lowered lubricating value of oil due to fuel leakage passed the rings can only be eliminated by removing oil every few days, filtering same carefully, distilling off the gasoline and kerosene and using the remaining oil half-and-half with new oil; or by the old methods of force feed oil leads to each cylinder and bearings.

It is almost universal practice to attach crankshafts to flywheel with a flange at least two and one-half times the diameter of crankshaft. Numerous methods are adopted on crankshafts to prevent oil from leaking out both front and rear end of the crankcase. Practice has not converged to any one method.

Valves

Valves—Clear diameter = 0.45 B. to 0.50 B.
Type of valve—poppet.
Material—High carbon alloy steels hardened all over.
Type of seat—45 deg. angle.
Valves inclosed.
Piston pin—hollow.
Material—0.20 carbon steel, case-hardened and ground and polished.
How held—either to piston or in connecting-rod.
Type of bearing—bronze.
Valve tappet—Mushroom or roller type. All wearing surfaces case-hardened and ground.
Timing gears—Crankshaft gear 0.30 carbon steel.
All others—Semi-steel.
Teeth not less than 8 pitch helical.

Crankcases

Crankcases whenever possible should be of aluminum with 8 per cent copper, commonly known as No. 12 alloy—firstly, because of its lightness; secondly, because of the rapidity with which it can be worked, and, thirdly, because of its high heat conductivity.

The design of crankcase usually revolves about the question of rigidity and that crankcase is the best which is the stiffest and the best conductor of heat. Usually the problem of compromise comes, in sacrificing stiffness to provide for a door into the crankcase for inspection. This can be met by making the doors oval rather than rectangular. Through bolts should be used wherever possible, and where aluminum is used, thread lengths should not be less than twice the diameter, and washers should be provided under the bolt heads and nuts that will distribute the pressure over as wide an area as possible, the area of washer to be three times the area of the bolt if possible.

In larger engines the crankcases are split horizontally, while in two-bearing crankshafts the barrel form of crankcase produces a very stiff case. A very stiff form of crankcase is that in which cylinder and upper case is cast in one. Combustion chamber should be formed in a removable head which, aside from the effective holding of the gasket, presents no serious problems but makes an admirable design for truck and tractor service.

Bearings

Bearing design, especially for connecting-rod crank end, is almost universally of high tin babbitt alloy in a comparatively thin layer backed up by various designs of backing held to the bearing material by tinning and other mechanical means. Great pains are now being taken to have accurate fits between connecting-rod and back of bushing to insure rapid heat dissipation.

Main-bearing bushings are held to the crankshaft case with accurate fit, but experience has taught that the better heat conductivity of the crankcase is such that die castings are used, if of good design and the same bearing material as the connecting-rod bearing.

One of the most difficult parts to hold is a bearing bushing on the crankshaft and especially the connecting-rod bearing. Brass screws are usually used to hold the bearings in place for assembling but are never sufficient for working conditions. For motor running up to the limit, great care must be taken to make the take-up shims assume the roll of keys and sufficient bearing on the shims and bushing must be pro-

vided to hold everything firmly in place without undue wear. A solid shim is the best, but few users can take up bearings except by removing their shims. Laminated shims are being used to a greater degree.

Flywheel Design

Experience has taught that a flywheel having a stored energy of 30 per cent more than is usual in passenger car service is a positive benefit in truck service and a great protection to the engine. Likewise, tractor engines should have about twice the stored energy that trucks have, this being figured at the average speed of passenger car engine against the speeds of maximum torque for truck and tractor engines. This is seldom attained in service up to this time, owing to limiting dimensions in the design of trucks and tractors.

In trucks, clutches have been converged down to three types, these being the cone, plate and multiple disk. This has determined the flywheel design to a large extent.

There is one fundamental difference between truck and tractor clutches. A truck clutch is engaged when the foot is off the pedal; while in tractor service the clutch must be engaged or disengaged or left in either condition while the foot is off the pedal. The most common tractor clutch is an expanding shoe clutch, counter-balanced, easily removable in part or whole without disturbing other parts of the tractor.

Connecting-Rods

These should be made of 0.35-0.45 carbon steel, heat-treated for an elastic limit of 70,000 lb. per sq. in. The design should be absolutely as light as possible. Recent investigations show that prevalent rod design is 33 per cent too heavy. While not always necessary, the trade demands four bolts in the crank end. These make adjustment of bearing more difficult. No doubt with stiffening of crank shafts, shortening of bearings with increase in diameter will brink back connecting-rods with one-bolt construction.

Bolts are of alloy steel, heat-treated to a strength of 120,000 lb. elastic limit.

In truck and tractor engines, the desirability of having rod bearings in line with the piston center is greater than in passenger cars. Connecting-rod length must be twice the stroke.

Camshafts

Camshafts in truck and tractor engines are different from passenger-car camshafts in that they are subjected to harder service and must be designed so that the surface on the cams and bearings will have ample area; in fact, more by 0.25 per cent than in automobile practice.

Camshaft material is usually 0.20 carbon steel, case-hardened and ground.

The timing on truck and tractor engines is very close to passenger-car engines, the main difference being in the closing of the intake. This is earlier than on passenger-car engines, due to the fact that maximum speeds of touring require higher motor speeds than those of truck or tractor service. Ability at lower speeds is very desirable in commercial service.

The bearing areas for the bearings in a camshaft based on satisfactory service are as follows, with cylinder area as unity, A:

Gear end, 0.20 A.
Center bearing, 0.30 A.
Flywheel end, 0.15 A.

Pistons

Pistons are usually made of semi-steel and are generally too heavy. Between 3½ and 5¼-in. bores pistons should not weigh over the amount indicated by the formula

$$W = 0.05\ B\ 3 \text{ lb.} \qquad (4)$$

This weight in the smaller sizes is entirely within the skill of foundry and machine-shop practice and these are the governing factors. One shop is now in quantity production in which piston weights are 10 per cent lighter than indicated by the formula.

The influence of piston, connecting-rod, piston pin and ring weight on the life of connecting-rod bearing is so definitely settled at all speeds that no designer can afford to have one grain more weight than necessary on any one of these parts.

No tendencies seem to be shown toward aluminum pistons in commercial engines, though it may be very much of an advantage to have a piston whose structure is aluminum, with bearing surfaces of some better material. Tractor pistons, because of the higher temperature at which they work, must have more clearance and this is also true of the gap in the ring. The following formula gives results of wide experience and has the advantage of being satisfactory for the following range of work:

Truck engines, light or heavy service, burning gasoline.
Tractor engines, light or heavy service, burning gasoline.
Truck or tractor engines, kerosene work.

$$Cs = 001\ B$$
$$Cm = 003\ B - 0.005$$
$$Ct = 003\ B$$
$$Ro = 003\ B$$

In which Cs is the clearance in diameter at the skirt, Cm clearance at the land between the top and second ring, Ct being the clearance at the top land; Ro opening of ring in a standard size cylinder at room temperature.

It must be said that the clearances indicated above presume an efficient system of lubrication and cylinder wall cooling. It must be urged that details of design in piston and cylinder such as good engineering will recognize also govern the clearance.

The piston ring fits and sizes recently adopted by this Society represent the best practice.

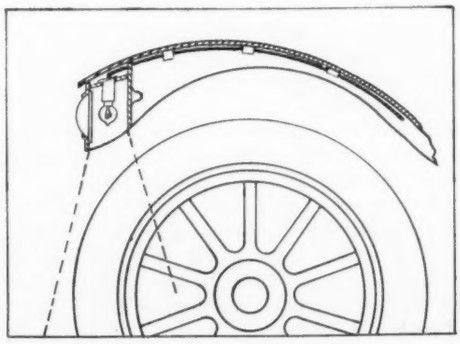
Inasmuch as the greatest friction losses in an engine are due to the piston, it is important that the piston have ample means of conveying and distributing oil along the cylinder. Usually three oil grooves are provided and a relief in the center wider than the piston pin drain is carried.

In the larger sizes, or from 5-in. up, cooling ribs are placed under the head running down the side of the piston. In some engines pins are cast in the head of the piston to facilitate cooling by oil.

A practice is becoming commoner of having a taper on the top land of the piston to insure an oil pocket or seal, so to speak, for the surplus oil pushed up by the piston and ring. While no definite proof has been found that this is superior construction, yet engines having the taper are giving superior heavy-duty service.

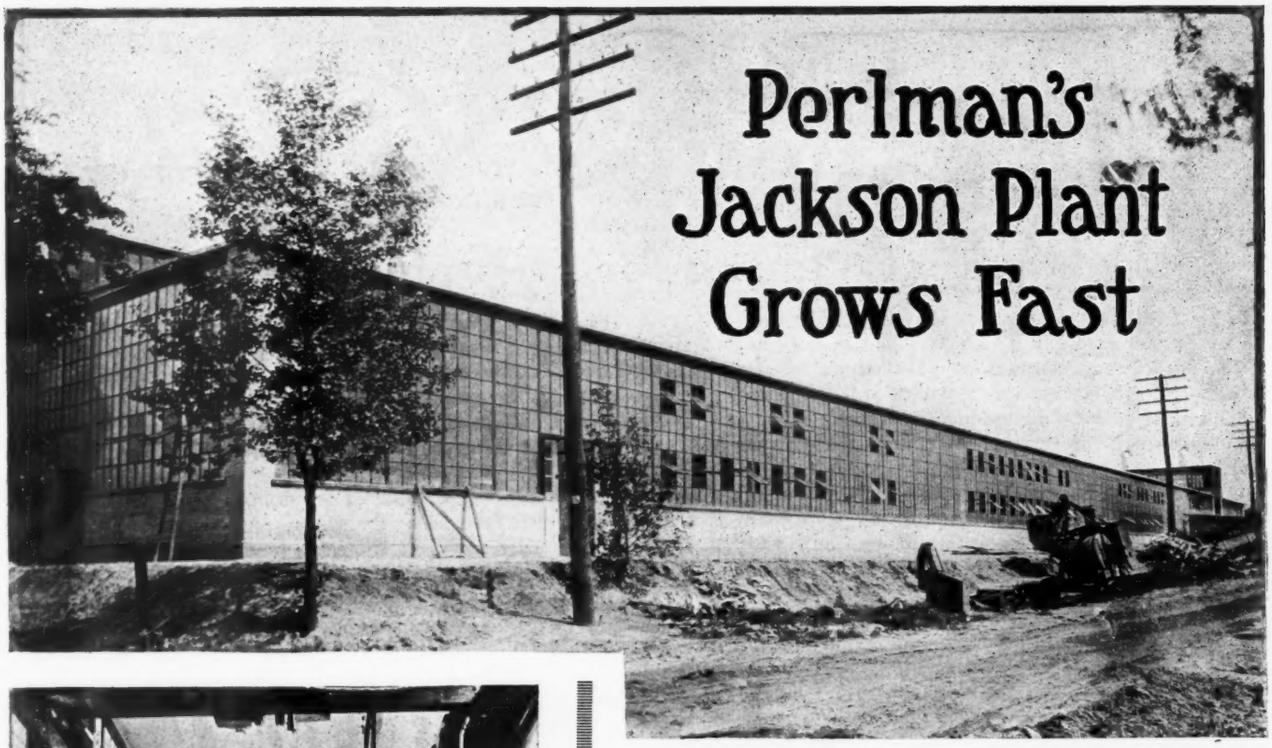
(To be continued)

A Sidelamp That Lights the Tire



An ingenious side lamp design recently patented by E. D. Shaw, Syracuse, N. Y. It throws a light ahead and also illuminates the front tire, which is a great convenience when driving into a garage or in city traffic

Perlman's Jackson Plant Grows Fast



Perlman Rim Corp's. completed plant at Jackson, Mich.

Finishing the floors and ceilings in record time

Ready for the final touches, Perlman rim plant in Jackson, Mich.

IT took 2 months and 14 days to put up the new plant for the Perlman Rim Corp. in Jackson, Mich. Thursday, April 6, the Austin Company got word to go ahead on a new building for this corporation at Jackson, Mich., 100 ft. wide by 320 ft. long. The complete structural steel for the job was there April 10, 4 days after the contract was signed. Before going ahead it was necessary to build 1300 ft. of railway siding, and there had to be a lot of shovel excavating before the sidetrack could be put in. Thursday, April 13, the Austin Company's steam shovel was on the job. Seven thousand yards of material had to be excavated. Monday, April 24, the lumber for purlins and roofing was on hand. Wednesday, May 3, they started steel erection, and Wednesday, May 10, 300 ft. of the steel was up complete. The roofing was very close behind when the completion of the brick work for the walls was more than half done.

The time in which the brick, steel sash and roof work were completed is exceptional. On June 1, all the main structural work, together with the steel sashing and wood roofing, was complete. Ten days more completed the composition roof and concrete flooring and by June 15 the glazing was done and a hemlock sub-floor added 2 days later. The maple flooring for the top was completed June 20. Thus in 19 days after the structural work was finished, the entire job was terminated.

Standardized Industrial Building

The building was done by the Austin Co., Cleveland, Ohio. This concern makes a specialty of standardized design, quick delivery industrial building. The Torbenson Gear & Axle Co. is having one of these standard buildings erected at a cost of $20,000. It is to be completed in 30 days and to be then ready for the manufacturer of passenger car and commercial vehicle axles.

The Rostrum

Correct Timing for a Hupmobile 20

EDITOR THE AUTOMOBILE:—What is the correct timing for a Hupmobile model 20? The engine has new rings with good compression. Maximum speed of car 20 m.p.h. and has not enough power to pull a 1 per cent grade on high. Evidently something is wrong. What carbureter would be good for this car? On the level the car will roll easily.

2—Why does not the battery ignition, for instance Delco, have a safety spark gap like the magneto to protect the windings? I refer to the true high tension.

3—Has Rickenbacher a foreign or American engine in his Maxwell?

Dayton, Ohio. H. A.

—The simplest manner of timing a model 20 Hupmobile motor is to turn the motor over by hand until No. 1 and No. 4 pistons are at extreme top center. With the crankshaft in this position, turn the camshaft over until the exhaust valve of No. 4 cylinder is just closing and the intake valve on No. 4 just opening. You will find there is a slight distance to travel between the moment that the exhaust valve closes and the intake valve opens. We would advise setting the camshaft as near the center of this distance as possible. Should you find it necessary to move the camshaft gear one-half tooth one way or the other in order that the gears may mesh properly, we would suggest that you retard the camshaft gear the necessary one-half tooth.

In setting the ignition we would advise that the magneto should be set so that the points in the breaker box should separate when the motor is ⅜ in. past the dead center flywheel travel. In other words, while the motor is in the position that it is when you finish timing the valves, turn the crankshaft so that you have ⅜ in. past the dead center line mark upon the flywheel. Then the magneto should be set so that the points in the breaker box are just breaking with the distributer brush, making contact with that terminal which leads to No. 1 cylinder.

A great many mechanics who are well acquainted with that type of spark which can be advanced and retarded will time the model 20 Hupmobile engine so that the spark will occur before dead center is reached. When this is done you will find that it will be practically impossible to obtain any power from the engine. Do not time this set spark type of magneto before dead center.

If the adjustments are properly made upon the Breeze carbureter you will obtain excellent service.

2—Battery systems have safety spark gaps in the high-tension coils.

3—The motor in Rickenbacher's car is American built.

Knocks Below 8 M.P.H.; All Right Above

Editor THE AUTOMOBILE:—I have a Buick D-45 1916. When I run it below 8 or 9 miles there is a knock in the engine. It is equipped with a Stromberg carbureter which I get from 17 to 18 miles to the gallon of gasoline. The engine works well above 8 or 9 miles.

Grant, Mont. J. N. M.

—It is probable that this knock is caused by one or more of the cylinders missing at low speeds and it may be that in installing the new carbureter this has been so adjusted as to cause this missing. It might be that a change in the adjustment of the carbureter will cure all of the trouble. If this does not do it no doubt the location of the cause will be found in the valves or ignition.

Sometimes it happens that a valve does not seat all the way, causing the motor to misfire in the same way as it would if the valves needed grinding. This may be due to too close an adjustment in the clearance. A misadjustment in the ignition will give the same kind of trouble. The timing should be set so that when the spark lever is in full retard position the spark occurs on upper dead center.

In all probability, though, the trouble will be found in the carbureter which is providing, in all likelihood, too lean a mixture at low speeds. The fact that you are getting as high an economy as you are may also signify that the setting is a little too lean.

Ammeter Probably in Damaged Condition

Editor THE AUTOMOBILE:—I have equipped my 1914 model Hudson six-40 with a model 301 Weston ammeter, with the following results: The ignition current goes through the instrument and does not seem to be as good as before. The lights do not burn as brightly, for if I place a screwdriver across the two terminals on the outside of the motor generator the lights immediately brighten up. Kindly advise me how to remedy this and still get a charge and discharge reading.

Richmond, Va. J. L. V.

—It is quite difficult to account for your trouble unless the instrument has been connected in circuit improperly at some time and the heavy current that is required for starting the engine has passed through it. The model 301 instrument is not intended for such service and might be badly injured if not wholly destroyed if such a connection has been made. Without knowing what terminals you refer to on the generator it is hard to explain what the effect of short-circuiting them will be but it is quite possible that other parts of your circuit besides the ammeter may be giving trouble. This refers to such things as brush contacts, cutout relays, etc.

Had to Make 75 M.P.H. at Omaha

Editor THE AUTOMOBILE:—What were the qualifying speeds of the cars in the Omaha, Neb., race of July 15, 1916?

2—What causes a 1916 Mercer motor to knock after the carbon has been removed and valves ground?

Flemington, N. J. O. M. V.

—At the Omaha race the cars were required to make a lap at an average speed of 75 m.p.h. before being allowed to compete.

2—There are a great many other causes for a motor knocking other than carbon and valves. Any loose part throughout the moving elements of an engine may be responsible for a knock. The most common causes are in loose bearings at either end of the connecting-rods, loose main bearings, worn pistons, etc. The camshaft bearings are sometimes responsible for a knock which cannot be found in any other

part. The bearings at each end of the connecting rod are the most common sources. If you would give more data regarding when the knock occurs and regarding its sound it would be easier to aid you in tracing the trouble.

Installing Ammeter on Hudson 54

Editor THE AUTOMOBILE:—Would you please inform me if it is possible to install an ammeter on a model 54 Hudson? If so kindly furnish a wiring diagram stating how the installation is made.

New York City. J. E. S.

—It is possible to install an ammeter on the model 54 Hudson and the manner in which the work is carried out is shown in the accompanying wiring diagram, Fig. 1. Remove the existing wire from the cutout terminal *A* and attach to one of the ammeter wires at *B*. The other wire from the ammeter is then connected to *A*. Should you notice that the ammeter reads "Charge" when it should read "Discharge," change the terminals about.

Full Retard on Top Center Position

Editor THE AUTOMOBILE:—What is the quickest and best way to find out whether a 22-72 Mercer engine is correct as to magneto setting? That is, if it is firing when it should. In other words, what is the best way to set the magneto?

2—Does the spark in a magneto occur when the points are together or just breaking?

Oshkosh, Wis. L. W. H.

—The magneto should be set so that in full retard position the spark occurs on upper dead center.

2—The spark does not occur until the instant that the points separate. It is the separation of the points which are in the low tension circuit that induces the current in the high-tension circuit. Therefore, no current is flowing to the high-tension circuit until after the breaker points are separated.

The reason for the spark being set at upper dead center at full retard is that a later spark than this is never required. When the engine is turning over very slowly, requiring the latest possible spark, if the setting is such that it occurs on upper dead center, the engine will not knock because before the spark could have taken place and ignited the gases the piston will have passed over the dead point and be again on its way down.

Engine May Be Loose in Frame

Editor THE AUTOMOBILE:—The distinctive clink commonly known as carbon knock developed in my motor and I had the carbon burned out. This did not seem to improve matters very much as the knock still occurs when the accelerator is depressed. Occasionally, while on the road this will cease for an hour or two and then recommence without my having touched anything. The trouble is less pronounced when the motor is very hot, as after a stiff climb. What can be the cause of this?

2—When running on first or second speed the gears make a terrible noise. At times, for no apparent reason, they can scarcely be heard. The trouble here seems to be connected with the engine trouble mentioned above as the two occur at the same time. Can you state the reason for this?

New York City. W. G.

—Your two questions seem to run together and give a clue to the nature of the trouble. It certainly would seem from what you submit that the engine is misaligned in the frame or loose. At times the alignment may be correct, thus causing the gears to act silently, whereas, at another time, the engine may become dislocated, throwing everything out of line, causing the knock you speak of as well as the growl in the gears.

It is suggested that you look into the fastenings of the engine to see if any of the bolts have loosened.

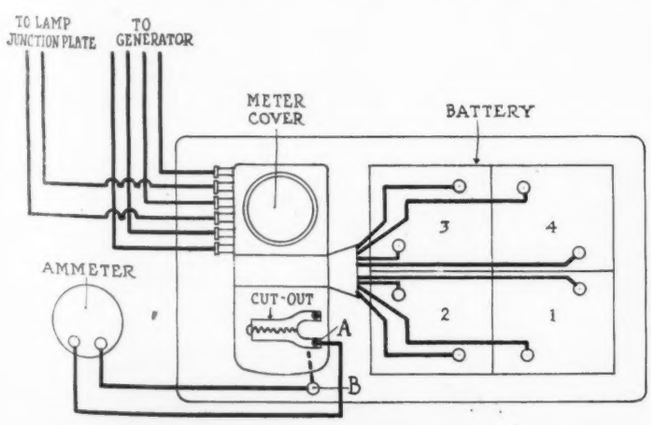


Fig. 1—Wiring diagram showing method of installing an ammeter on a Hudson model 54

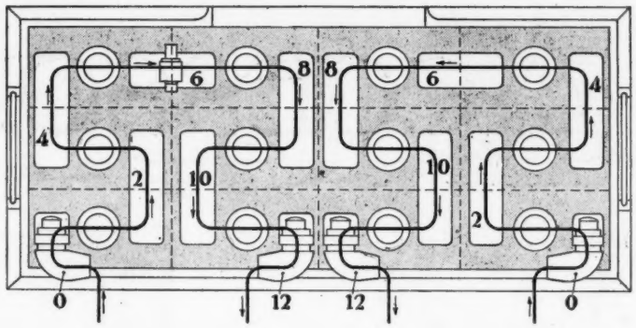


Fig. 2—Wiring diagram showing voltages and cells of battery in U. S. L. electric system used on Rambler cross-country and 1913 Oakland

Diagram Showing Voltages in U-S-L System

Editor THE AUTOMOBILE:—Kindly give wiring diagram showing voltages and cells of battery in the U-S-L electric lighting and starting system on the Rambler cross-country car and the 1913 Overland.

2—Kindly advise whether or not the electric lighting and starting companies would furnish various wiring diagrams of their wiring system by writing for them.

Trinidad, Col. W. H. O.

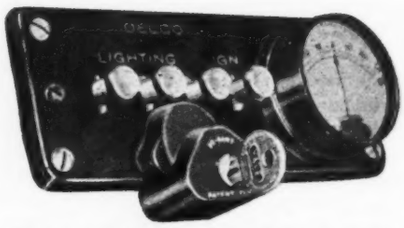
—While it is not quite clear what wiring diagram you desire, it is probable that you wish the diagram of the U. S. L. type EL-1207 battery which was used on these cars. This is given in Fig. 2. The cells are marked off on the battery by dotted lines, and the current is traced through the battery when discharging by the full lines with the direction of the current indicated by arrow heads. The cells are assembled in two separate groups of 12 volts each and on each length is marked the nominal voltage with relation to the negative terminals of the group in which it is contained. It is important to note, in connection with the voltage readings of the batteries, that this varies considerably, depending upon whether the battery is being charged or discharged and it will also vary with the rate of charge or discharge. The voltage as given will be obtained unless the battery is in a badly discharged condition, while the battery is undergoing a light discharge as when delivering the full lamp load. Under severe starting conditions the voltage may only be three-quarters of that given while the starting current is flowing. Should this not cover what you desire more complete diagram can be secured through the Rostrum department.

2—They probably would in most instances.

ACCESSORIES

Bo-Hart Switch Lock

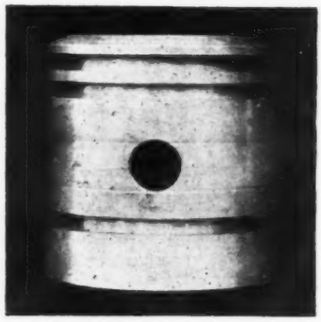
A SWITCH lock capable of being fitted to a switch plate is just being put on the market. The device is shown in the accompanying illustration attached to a Delco switch faceplate. The lock is comprised of a three-tumble Yale barrel provided with a small gear transmission to interconnect the Yale barrel with the regular locking bar of the switch, and when the lock is applied the Yale barrel and the locking bar of the switch are so interrelated that it is impossible to shift one without shifting both, thus preventing the throwing of the locking bar of the switch through any other means than by the use of the Yale key. These locks are applied to the switchplate at a cost of $4 each retail.—Bo-Hart Auto & Machine Co., Lancaster, N. Y.



Bo-Hart switch lock as fitted to Delco switch faceplate

Featherweight Pistons for Fords

These pistons are of aluminum alloy and are designed to meet the demand for durable light-weight pistons for the Ford engine. Each piston weighs but 1 lb., this feature of the installation tending to reduce vibration and to decrease the wear on the engine parts. Pistons are made in four sizes: the standard, 0.0025 oversize; 0.031 and 0.033 oversize for rebored cylinders. Price, $15 per set, including pins and rings. Featherweight Piston Co., 11 Guyman Way, Pittsburgh, Pa.



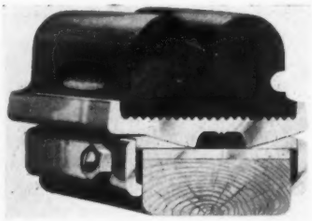
Featherweight aluminum alloy piston for Ford cars. These pistons are made in four sizes

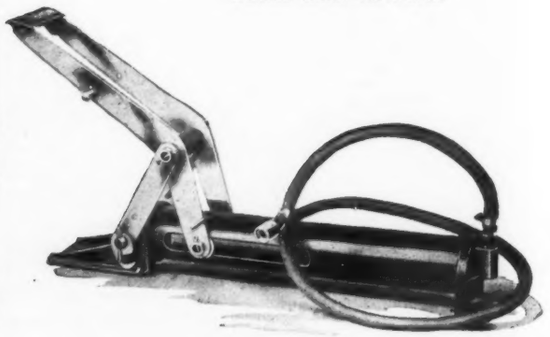
Goodyear Fire Truck Tire

The Goodyear new hand-attachable cushion fire truck tire supersedes the company's cushion demountable type largely used in commercial and fire service. This tire is designed for motor truck and fire apparatus use also, but is stated by the Goodyear company to be tougher, more resilient and able to resist road punishment better than the previous design. The tread is illustrated herewith in section and as a complete unit.—Goodyear Tire and Rubber Co., Akron, Ohio.

Twombly Foot Pump

This pump, as the name signifies, is operated by the foot and the simple leverage action employed multiplies the air pressure delivered to the tire, while at the same time minimizing the effort required on the part of the operator. The manufacturer states that a 34 by 4-in. tire can be inflated to 80-lb. pressure without causing even slight fatigue, due to the fact that no bending of the body is required, the easy action of the pump and the frequent and powerful impulses. A special attachment is provided which locks the pump connection to the tire valve so positively that leakage in pumping is eliminated and the connection is not broken by high air pressure. The pump is 17 by 3-in. over all and is easily packed in the tool box. It contains no parts which will become broken easily under hard service. Price, $4.50.—Schlesinger-Redburn Corp., 1834 Broadway, New York City.





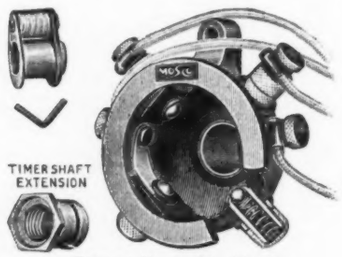
Above—The new Goodyear hand-attachable cushion tire designed for use on automobile fire trucks. Right — Twombly tire pump which is operated by the foot

Ft. Wayne Battery Charger

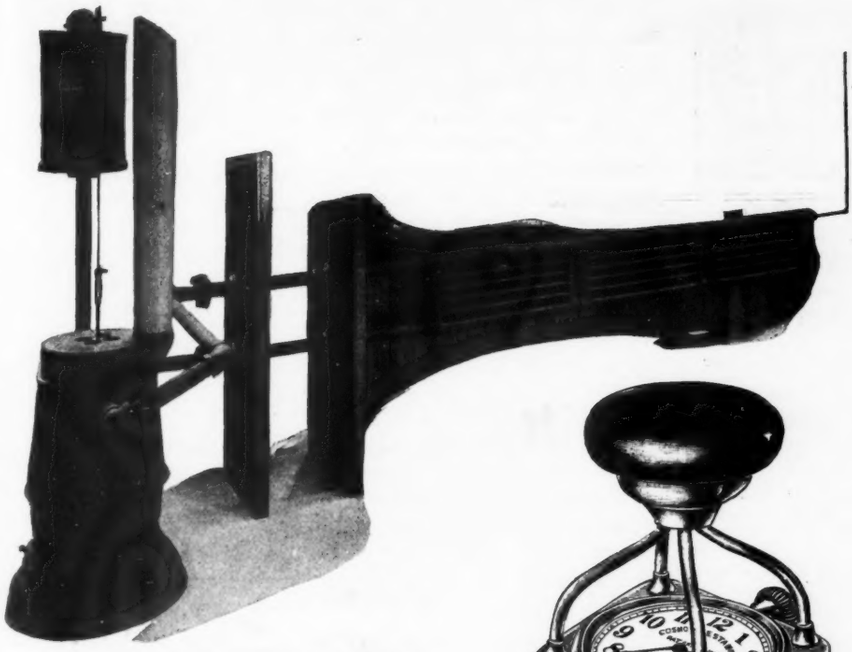
This outfit consists of a motor generator designed to deliver current at 12, 18 and 24 volts and operating from 110 or 220 volts, 60-cycle, alternating current or direct current line. The switchboard panel is mounted on the machine and carries on it the ammeter and voltmeter. Lamp boards are used for resistance. There is a snap switch on the switchboard in the line circuit for the purpose of starting and stopping, the snap switch for opening and closing the charging circuit, a voltmeter for reading the voltage delivered to the generator, an ammeter for reading the charging current, and a field rheostat for raising or lowering the voltage of the generator. The rheostat provided on the switchboard has sufficient capacity to reduce the voltage to 6. The outfits are supplied in 175 and 250 watts capacity.—Ft. Wayne Electric Wks. of the General Electric Co., Fort Wayne, Ind.

Bemus Timer for Fords

In this device contact is made by a hardened steel brush engaging steel balls, the brush and balls turning each time so that new surfaces are continually in contact. Little oil is required, as friction between the balls and the roller is mini-



Bemus timer for Fords



The Wasco private garage heating system can be supplied for one to six-car garages. The heater burns either hard or soft coal of chestnut or pea size, and is fitted with an automatic regulator

mized. The roller is long enough to permit each ball to have a path, lengthening the life of the parts. The shell is made from one piece of an insulating material designed to be strong and impervious to oil and grease. The timer sells for $2.50.—Motor Specialties Co., Waltham, Mass.

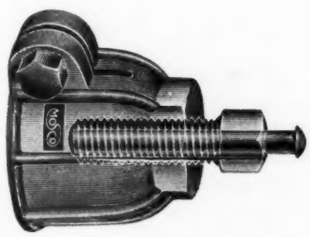
Wasco Garage Heater

The Wasco is a hot-water heating system for private garages. It is equipped with an automatic regulator that is said to give an even heat under varying climatic conditions. The complete outfit consists of a cast iron hot-water heater, one-piece radiator and hot-water cylinder and piping cut to fit. The heater burns either hard or soft coal of pea, chestnut or stove size. Heaters are built for garages housing from one to six cars, the small single radiator system being suited to the 10 by 12 ft. garage. Prices, $35 to $75, depending on the size of the garage. —W. A. Schleit Mfg. Co., Inc., Syracuse, N. Y.

Cosmo Time Stamp

Stamps the time card with the time at the beginning and end of the job, giving the elapsed time accurately. A small metal case holds the watch and carries the stamp indicating the day, hour and minute. Four different models are made, model A having a twelve-hour dial, stem winding and setting. The model AA is the same, except that it has key wind. Model B has a twenty-four hour dial, as has the model BB, the former being stem wind and the latter key wind. This

The Cosmo time stamp is convenient to use, promotes efficiency and protects both the owner and the repairshop man

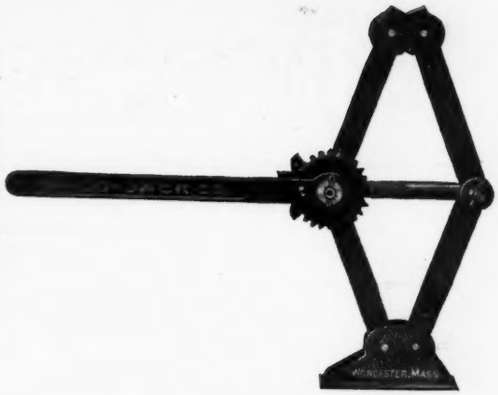


Wheel puller for Ford

time system promotes efficiency, and furnishes the repairman with evidence that cannot be disputed. Price, $7, plain dial. —A. D. Joslin Co., 221 W. Erie Street, Chicago, Ill.

Hi-Lo-Jack

By the use of the toggle joint principle this jack enables the operator to lift a heavy weight with minimum exertion. As shown in the illustration, the upper joints of the toggle are fastened to the top of the jack and the lower joints to the base. The horizontal screw connects the two other joints and applies the leverage which raises or lowers the jack. The side pressure is taken by a ball thrust which eliminates friction and makes lifting easier. When closed the jack is 5 in. high and will lift the load



Hi-Lo-Jack extended

Hi-Lo-Jack in closed pose

to 17 in., the lifting power increasing with the height. A graduated scale shows tons in inches that can be lifted with safety.—Hi-Lo-Jack Co., 140 Green Street, Worcester, Mass.

Wheel Puller for Fords

A loose plunger extending through the center of the screw enables this device to loosen a wheel which is frozen to the axle. The hub cap is removed, the puller screwed on and the set screw tightened. A sharp blow with a hammer on the end of the plunger starts the wheel. Pullers of the same type are made for Overland, Buick, Maxwell, Saxon and Chevrolet cars. The Ford model sells for $1.—Motor Specialties Co., Waltham, Mass.

Wausau Abrasives

Flint paper, emery paper, garnet paper and Wausite are made in various degrees of fineness to suit different work. A handy product is the Wausau waste-proof strip, which consists of a 50-yd. ribbon of emery cloth wound on a spool so that it may be placed conveniently above the bench.—Wausau Abrasives Co., Wausau, Wis.

Resistoil Air Hose

This compression air hose has special oil resisting qualities. The walls are made up similar to the common five-ply hose, which it resembles in outward appearance. The interior of the hose is lined with a special compound that is said to have oil resisting properties, and to resist the action of any oil or oil fumes that may be in the air. Prices, 3/16 in. inside diameter, 16 cents per ft.; ¼ in. inside diameter, 18 cents per ft.; ½ in. inside diameter, 27 cents per ft.—Brunner Mfg. Co., Utica, N. Y.

The Automobile

PUBLISHED WEEKLY

Vol. XXXV Thursday, September 14, 1916 No. 11

THE CLASS JOURNAL COMPANY

Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
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231-241 West 39th Street, New York City

EDITORIAL

David Beecroft, Directing Editor
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BRANCH OFFICES

Chicago—Mallers Bldg., 59 East Madison St., Phone Randolph 6960
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Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Overdoing Accessories

THE past few years have seen the automobile accessory field extended to an enormous degree and the signs indicate that the limit of what may be called for as stock equipment has been reached. As an example, one prominent Detroit firm has been asked by some of its dealers to supply electric motors on its closed cars whose sole mission in life shall be to open and close the windows on the pressure of a button. Accessories of this sort have no useful purpose. They are merely toys and rank with the big dolls which some fashionable ladies have carried in their arms at the shore resorts this summer. The production of such things is perfectly legitimate, but no manufacturer with a legitimate claim to a place in the industry would seek business on the strength of such accessories.

Small Spark Plugs

IT has become obvious that the S. A. E. will very shortly be compelled to standardize a spark plug of smaller size than the present standard because the larger plug will not stand up in aviation engines or other engines with a very high mean effective pressure and correspondingly high internal temperatures. Makers of aviation engines are unanimously in favor of the metric size of plug and at the other end of the engine scale it is being found that the small plug operates better in tractor engines burning kerosene. On racing engines the small plug is essential and for very high duty touring car motors the small plug has a longer life than the S. A. E. standard plug.

Since engine pressures, speeds and temperatures are generally on the increase, it seems probable that the small plug will become desirable for a wider field than that provided by the aeroplane and tractor requirements, so there is little doubt that the society will have to standardize a small plug in addition to the existing standard. If this is done it is to be hoped the metric plug be chosen and not a plug of similar size with an inch thread, because the metric plug is in universal use in many other countries. Most of the cars exported to British colonies and to South America by several leading manufacturers are supplied with metric plugs.

Adding a small standard would possibly lead to the gradual abandonment of the large plug now standard, but it will be a long time before a complete change takes place, if indeed it ever does. However, so many spark plug makers are now producing metric plugs for export that there should be no difficulty in supplying a sufficiency of the small type to meet any domestic demand that may arise.

The Ford Race

WHY did 10,000 people go to see the Ford race in Chicago? There is a lesson beneath the surface in the interest taken in this event, a lesson that may possibly be applied to all racing and not only to those where a single factory is represented. What is the psychology behind the enthusiasm of these spectators? Certainly not the speed, for even though this was high, it did not approach that of the classics at which the enthusiasm of the spectators has not increased in ratio with the speed made.

There was a human interest feature present that has been lacking in some of the major events which have not been proportionately greater in attendance when the thousands of dollars spent on advertising is taken into account, and the caliber of the drivers is considered. Any man with $400 can buy a Ford. They are on the open market and not beyond the pale of possibility for the ordinary individual. Any man is naturally interested in the performance of a machine which is like one he owns or one he could own if he desired.

Here is a contest for cars that a man can buy. Even if they were made over, and tuned up, the foundation started from a car that is available to the ordinary citizen. In other words, a *stock* car, one produced by a well-known factory. This is the point which puts the interest into the race for the average motorist. If our classics to-day carried the names of our well-known factories in the entry lists, there would be a wonderful revival of interest.

Races as they stand now have not got the personal interest. Talk about Fords and you talk straight to every motorist. Talk about Peugeots and Sunbeams and you do not hit him nearly as hard.

U. S. A. Cars Most Popular in British South Africa

European-Built Cars Not Available and American Machines Win Favor By Performance on Rough Roads and Because of Low Prices

NEW YORK CITY, Sept. 8—One of the largest and best known dealers in British South Africa is at present in this country making arrangements for distributing U. S. A. accessories throughout that country, as well as traveling over the majority of the United States. This person is Wm. Campbell of Johannesburg, who is the Maxwell dealer in that city and also represents Prest-O-Lite batteries, Simms magnetoes and other U. S. A. products.

Mr. Campbell, a Scotchman by birth, has the reputation of being one of the shrewdest dealers in that country. In the last 9 months he distributed over 600 Maxwell cars, and will exceed that figure very materially this year. He sold 50 to the government for war purposes in German East Africa.

According to Mr. Campbell, the U. S. A. cars are selling in greater quantities than any other cars in British South Africa. This is partly due to the fact that European cars are not available, and also to the fact that our cars are low-priced and well suited for the rough roads of British South Africa.

Farmers Good Buyers

The majority of U. S. A. cars are sold to farmers who reckon their land in morgens instead of acres. A morgen equals 2.5 acres and many of the farmers own 10,000 or more morgens. South Africa thus resembles Argentina in that it is not a land of small farmers as in our Mississippi River valley, this being due to great areas and sparse population.

At present Ford is the biggest seller in British South Africa, with Maxwell a close second. Other large sellers are Overland, Buick, Studebaker, Hupmobile, Chevrolet, Dodge and Cadillac. Cadillac has been the largest seller of U. S. A. high-priced cars. From four to six times as many of these cars have been sold since the war as prior to it, a condition largely due to the inability to secure European cars.

Roads Are Lacking

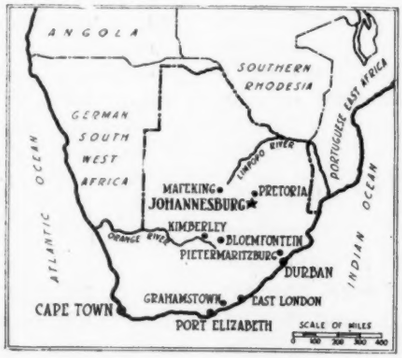
British South Africa is a country without roads. In this respect it is worse than Australia, worse than Argentina and practically as bad as Brazil. In Johannesburg, a city of 200,000 whites, there are good roads no further than 5 miles out in the country. In British South Africa the population of cities is generally estimated on the number of whites, as they represent the potential purchasing capacity of the city. In addition to these whites there are 500,000 colored people in the Greater Johannesburg area, giving a total population of 750,000.

Outside of the cities the roads are mere trails, two ruts, and often between these the ground is often 6 to 8 in. high, which demands cars of good clearance, 10 in. being best suited for the work. In many places the cars are driven directly across the veldt or plains. Recently Mr. Campbell made a trip of 1826 miles, driving from Cape Town at the south end of the continent to Johannesburg. The distance between these two towns is 1000 miles by direct route. Generally speaking there are few if any bridges, making fording essential.

Pass to the Left

According to the rules of the road in British South Africa you pass to the left, instead of to the right, as we do. This calls for cars with steering wheel on the right hand side, the same as required in South America, Australia and England.

The five-passenger touring car is the big seller. The sale in roadsters is perhaps 10 per cent that of touring cars. There is a very limited demand for coupés, but practically none for sedans or cabriolets.



British South Africa, showing the larger population centers—Johannesburg is destined to be the great automobile and supplies distributing point

Only 15,000 Cars

Mr. Campbell can place no estimate on the total number of cars in British South Africa. The figure is somewhere near 15,000. The country has a total population of 1,250,000, or a little less than Uruguay in South America.

At present there are approximately the following number of automobiles in the following cities:

Johannesburg	6,000
Cape Town	4,000
Durban	500
Bloomfontain	500
Port Elizabeth	400
East London	300
Kimberly	200

The high price of gasoline is a big factor in South Africa, where the imperial gallon retails at 88 cents in Johannesburg, and but a little lower at Cape Town and other coast cities. The imperial gallon is approximately one-sixth larger than the gallon used in the U. S. A. With gasoline at this price it is essential to have cars that will show good performances, and 30 to 35 miles per gallon is necessary. Gasoline is handled in British Africa much the same as in England, namely in crates of two 5-gal. cans each. Handling it by bulk has not yet taken hold.

Accessory Market Good

The possibilities for U. S. A. accessory manufacturers are good in British South Africa. Already many of our leading accessories are handled there. Some of them are sold through New York exporting houses, and others are handled through large distributors who deal direct with the U. S. A. manufacturers. There is a big market for pumps of all kinds, head lights, shock absorbers, searchlights, dash lights, and in general all car fitments, that is, little devices that really improve the value of the car to the owner.

Unfortunately U. S. A. accessory trade in British South Africa has suffered because our accessory makers have not been dealing direct with the big distributors in that market. As a result some lines of goods that should be in much demand there are in ill favor. This is not due to the goods themselves but

Studebaker Plans Expansion

Will Expend $1,500,000 on Factories in Detroit and South Bend

DETROIT, MICH., Sept. 8—Plant expansion to cost $1,500,000 has been announced by the Studebaker Corp., this applying to the factories here and at South Bend, Ind. When these extensive undertakings are completed the capacity of the combined factories will make it possible for the corporation to exceed a $100,000,000 annual turnover, according to A. R. Erskine, president.

Already contracts have been let for the construction of a large modern foundry and an extensive machine shop to be erected on part of the land now occupied for lumber storage at the South Bend factory. The foundry will be 1100 ft. long and 150 ft. wide, with four cupolas and 250 tons daily melting capacity, and it is to be completed by July 1 next. The machine shop is to be about 900 ft. long by 300 ft. in width, and will double present machine shop facilities at South Bend.

Detroit contracts are now being let for the construction of a one-story building with about 25,000 sq. ft. of floorspace, adjoining plant No. 3, which is located on the west side of the city. It will be devoted to final assembly work. Another floor, measuring 50 by 300 ft., is to be built on one of the three-story buildings now used as a warehouse for materials. This latter addition will enable the still greater stocking up of materials in advance of immediate needs. Other extensive additions to the Detroit plants are to be made, but details of these are not given out at this time.

Automobile Gain the Cause

It is pointed out that these plant extensions of the corporation are made necessary because of the development and growth of the Studebaker automobile business during the past 5 years. In 1911 the sales of the concern amounted to $28,487,000 and included 22,555 automobiles. In 1915 the sales had increased to $56,539,000, during which year 46,850 automobiles were sold. It is predicted by President Erskine that in the current year Studebaker sales will approximate $70,000,000, and the number of cars 75,000. During the 5 years under review, the real estate and plant investment account of the corporation has increased from $10,554,000 to $12,400,000, or nearly $2,000,000, so it appears the corporation was able to increase the production capacity of the factories without increasing the investment in proportion to the increase in business.

At South Bend alone the new buildings will mean the adding of 1000 men to the working force, and at Detroit the number will be swelled to 7000.

Few persons realize the extent of the automobile operations now carried on at the South Bend factories, the public generally regarding this part of the big corporation as being devoted to carriage, wagon and harness business entirely. Prior to 1912 the South Bend works were devoted exclusively to the manufacture of horse-drawn vehicles and harness, but in the latter part of that year the making of automobile springs and some castings was commenced. In 1914 the automobile body factory was installed, and last year some light stampings were first manufactured in South Bend. Now the plants in that city are manufacturing automobile parts for the Detroit plants of the value of over $10,000,000 per year, and the average number of employees has increased from 2701 in 1912 to 5023 at the present time, due to the use on motor vehicle work of available facilities at South Bend.

H. A. L. Plans Greater Business

CLEVELAND, OHIO, Sept. 11—Following the elevation of A. Ward Foote to the presidency of the H. A. Lozier Co., plans have been made for an increased production. The company was formed last Winter, made first deliveries of the H. A. L. in May and plans to have delivered 1000 by the end of the present year. Merchandise orders have been placed for material for 2000 cars for the 1917 calendar year. A change in the corporate name is contemplated. The company as now constituted includes:

President, A. Ward Foote, president of the Foote-Burt Co., Cleveland, machinery maker; vice-president, Charles C. Homan, former Overland purchasing agent; secretary, Frank H. Ginn, attorney; treasurer, E. G. Tillotson, of Tillotson & Walcott, bankers; the directors are the officers and the following: George E. Randles, vice-president, Foote-Burt Co.; Amons N. Baron general manager, National Carbon Co.; Morris Towson, president, Elwell-Parker Co., machinery maker, and also director in Anderson Electric Car Co. George H. Bowler is general sales manager. Jay Lee Cross has gone with the company as manager of the advertising department. Practically all of the stock is owned in Cleveland. The capitialization now is $700,000.

Harvey Adds Heat Treating Building

RACINE, WIS., Sept. 7—The Harvey Spring & Forging Co., this city, has broken ground for a new fireproof building, 100 by 200 ft., of steel construction, to be used exclusively for forming and heat treating automobile springs.

Italian Tire Plants Are Busy

Conditions Little Affected by War—American Cars Not in Demand

NEW YORK CITY, Sept. 8—The tire industry in Italy is at present in a very prosperous condition. G. A. Pirelli, son of the owner of the Pirelli Tire Co., which employs 10,000 in its various factories, is visiting this country to make purchases of machinery and other supplies for his father's plants in Bicocca, Italy; Barcelona, Spain, and Southampton, England. This company is the largest producer of tires in Italy and has been in the tire business 15 years. Over 1500 pneumatic tires and tubes are turned out daily and truck tires number about 800 daily.

As there are only two other large tire concerns in Italy, namely, Michelin and Tedeschi, the tire production is one of the most important branches of the automobile industry there, as it supplies nearly 130,000 cars and has little competition from other countries.

War Orders a Factor

The Italian tire, automobile and truck firms are busy at the present time with war orders, which constitute most of the business. Industrial conditions have been little hampered by the war and the factories have kept busy supplying the government and domestic wants. New plants are being built to take care of this large demand.

Mr. Pirelli states that there is little demand in Italy for our automobiles, especially the low-priced cars. The purchasing of cars is by the wealthy class, who want expensive bodies and high-class finish, regardless of the price. The middle and poorer classes who cannot afford cars are satisfied to ride in the street cars, or if a long trip is made, to ride in a taxicab, which may be had at a very reasonable price.

Self-starters and electric gear shifters are not in demand in Italy. This is explained by the fact that very few cars are driven by the owners and as a consequence such labor-saving equipment is not considered necessary.

Keller Tool Moves to Grand Haven

FOND DU LAC, WIS., Sept. 9—The Keller Pneumatic Tool Co., Fond du Lac, has decided to move its works and general offices to Grand Haven, Mich., and will maintain the present plant as a branch. The Chamber of Commerce of Grand Haven has provided a free site and local capital will become interested to the extent of $60,000. The first of a new group of shops will be undertaken at once. It will be 90 by 300 ft.

S.A.E. Memberships for Aero Men

Dues Cancelled if A. S. Members Join S.A.E. Within Next 90 Days

NEW YORK CITY, Sept. 12—At to-day's meeting of the council of the Society of Automobile Engineers it was decided to admit membership of the Aeronautical Society into the S. A. E. without payment of annual dues, providing these memberships are taken out within a period of 90 days. This action is a natural step in the development of the Society of Automotive Engineers, which will be the new name of the S. A. E. after the first of the year. The aeronautical engineers were the first to express a desire for co-operation with the S. A. E. under its new name, and already upward of thirty of their leading engineers have applied for membership. It is anticipated that other engineering societies will amalgamate in the Societiy of Automotive Engineers. Already the National Gas Engine Association has expressed interest in the possibilities of one large engineering society such as the Socety of Automotive Engineers. Overtures have been under way with the Society of Tractor Engineers and interest has been shown by the marine and motorboat engineers. It would be greatly for the benefit of all these societies for them to pursue their work under the one title of Society of Automotive Engineers.

100 Per Cent Financial Gain

The success of the S. A. E. during the present fiscal year, which will end Oct. 1, was well indicated by the treasurer's report, which approximated that the profits for the year would be close to $14,000, or nearly double the profits of the 1915 year. The total assets at the end of the 1916 fiscal year will approximate $30,000, as compared with slightly over $8,000 at the end of the last fiscal period. During the present year the society has made several investments, one being the purchase of approximately $10,000 worth of bonds, which investment has been handled by the finance committee. The society has other investments in the form of certificates of deposit approximating $19,000. On its various investments it will earn over $1,100 interest this year.

100 New Members

It is rare that so many new members are taken into the society at any one time as was the case at to-day's meeting. A round total of 100 were admitted to membership into the different grades, as follows: Membership, fifty-three; associates, thirty-seven, and junior, eleven. In addition, there was considerable student enrollment. C. W. McKinley, engineer of the Willys-Overland Co., was elected to membership in the council to succeed past President Harry M. Leland.

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Kettering to Talk on Temperature

DETROIT, MICH., Sept. 9—Motor Temperature Control is the very interesting title of a paper to be presented at the next meeting of the Detroit Section of the Society of Automobile Engineers by C. F. Kettering, vice-president and general manager of the Dayton Engineering Laboratories Co. The meeting is scheduled for Sept. 14, and is to be held in the convention hall of the Pontchartrain Hotel. The society predicts a record-breaking attendance at this first meeting of the new season. Mr. Kettering is eminently qualified to give an authoritative paper on this subject, which is engrossing the engineering fraternity at the present time, and some valuable information will undoubtedly be forthcoming.

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Pushing Work on Dann Factory

CLEVELAND, OHIO, Sept. 11—Work on the new factory for the Dann Products Co. is progressing and E. G. Dann, general manager, states that the plant will be operating at full capacity by Oct. 1. This company manufacturers the Dann Insert and the new bearing metal Dannite.

The new building adjoins the plant of the Jordan Motor Car Co. and is 150 ft. by 300 ft., including unusual lighting facilities, and every possible convenience for the welfare of the workers. The company is moving to Cleveland from Chicago and has recently raised its capitalization from $60,000 to $600,000.

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Firestone Making 12,000 Tires a Day

AKRON, OHIO, Sept. 11 — Statements published in connection with the announcement of the contemplated stock dividend of the Firestone Tire & Rubber Co. show that the plant is now turning out 12,000 tires a day.

Last year the output increased 78 per cent and 50 per cent more dealers were added so that production has not yet kept pace with sales.

The Firestone Tire & Rubber Co. is now building one of the best equipped club houses in the country for its employees. The first and second floors will contain a restaurant, while the basement will have a swimming pool, shower baths and bowling alleys. The third floor will be taken up with an auditorium and club rooms.

This company has also purchased several hundred acres of land and contemplates the establishment of a Firestone Bank to help its employees to finance their own home building.

Independents Meet S. O. Reduction

Texas Co. and Others Cut Prices 1 Cent in East and West

CHICAGO, ILL., Sept. 9—The Texas Co. and other independent oil concerns met the Standard Oil Co. of Indiana's 1-cent reduction in gasoline throughout the West by making Chicago tank wagon basis 16½ cents a gal.

The Standard Oil Co. in Kansas City, Mo., has reduced gasoline 1 cent a gal., to 15.8 cents tank wagon basis, and independents have cut prices 1 cent, to 16.8 cents tank wagon basis to meet the new market conditions.

The price of gasoline was cut another cent in Detroit, Sept. 7, by the Standard Oil Co., being obtainable at any of the Standard's forty filling stations in the city at 17 cents a gal. So far the independents have not met the reduction, some demanding 18 cents and others getting as high as 19 and 20 cents, the latter price being asked by individual garages in some instances.

The Texas Co. has met the 1-cent reduction of the Standard Oil Co. in the East, covering New York State, Connecticut and New Jersey. Texas gasoline in New York and Connecticut is quoting at 22 cents tank wagon basis and in New Jersey at 20 cents. The Standard Oil Co. brought its price down to 22 cents on Sept. 7.

Lower in West

Gasoline prices have been reduced 1 cent a gal., tank wagon basis, in Colorado, Montana, Wyoming and New Mexico. Current prices are: Colorado, 21 cents minimum to 25 cents maximum; Montana, 23 cents minimum to 24½ cents maximum; New Mexico, 20 cents minimum to 24½ cents maximum; and Wyoming, 1912 minimum to 23½ maximum.

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Irwin Leaves Adams Truck to Join Allen M. C. Co.

FINDLAY, OHIO, Sept. 7—Murray Irwin has resigned his position as general manager of the Adams Foundry, Machine & Truck Co., and joined the Allen Motor Car Co., Fostoria. George Carter of Jackson, Mich., has been placed at the head of the Adams plant.

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Standard Traffic Code Distributed

NEW YORK CITY, Sept. 12—The Standard Code of Traffic Regulations which has been drawn up tentatively by the Street Traffic Committee of the Safety First Federation of America has been

submitted to municipalities for adoption. The code represents the work of a year and a half on the part of the committee with consultations and assistance from traffic experts throughout the United States and Canada. It is comprehensive, covering all the possibilities of traffic regulation down to its most minute detail. The headlight glare regulation is one that has been approved by the Society of Automobile Engineers and provides for an illumination up to 150 ft. in front of the car wherever the highway is not sufficiently lit by street lamps and also that no portion of the beam of reflected light when measured 75 ft. or more ahead of the lamp shall rise above 42 in. from the level surface on which the vehicle stands. The S. A. E. standard license plate is also indorsed as well as a standard gearshifting gate.

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Lansing Foundry Elects Officers

LANSING, MICH., Sept. 6—At the annual meeting of the directors and officials of the Lansing Foundry Co., the following officers and directors were reelected: J. H. Moore, president; Ray Potter, vice-president; Mark C. Knight, treasurer, and S. P. Spaulding, secretary. These officers and W. H. Newbrough, E. W. Goodnow and E. W. Harper make up the board of directors.

The foundry is being operated to its full capacity and has so many orders on its books that it has refused to take on more business. It is likely that the plant will be enlarged within the next year.

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Marathon Tire Convention Starts

CUYAHOGA FALLS, OHIO, Sept. 8—The Marathon Tire & Rubber Co., this city, will hold its annual sales convention at its factory during the week commencing Sept. 11, under the direction of H. H. Replogle, sales manager.

6501 Vehicles Exported in July

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5258 Passenger Cars and 1243 Trucks and Parts Worth $1,630,111

WASHINGTON, D. C., Sept. 9—While there has been a decided drop in the demand for commercial cars, due to the curtailing of orders from the warring nations in Europe, exports of passenger cars show a big increase during July and the 7 months ended July as compared with the same periods of last year. Statistics of automobile shipments during those periods have just been made public by the Department of Commerce, and show that during July last 1243 commercial cars, valued at $3,062,670, and 5258 passenger cars, valued at $3,663,563, were exported, together with parts, not including engines and tires, to the value of $1,630,111. During the 7 months' period of this year the exports were divided as follows: Commercial cars, 11,373, valued at $30,725,682; passenger cars, 38,407, valued at $25,897,743; parts, not including engines and tires, $13,175,266.

During July a year ago the exports were 2469 commercial cars, valued at $6,803,001, and 4118 passenger cars, valued at $3,835,347. The value of the exports of parts, not including engines and tires, was $1,663,997. For the 7 months of last year the exports were 13,428 commercial cars, valued at $37,499,768, and 22,897 passenger cars, valued at $20,454,354, while the value of the parts exported, exclusive of engines and tires, was $7,343,119.

France Leads in July

France held first place in the value of the imports of American cars during July last, 538 cars, valued at $1,354,968, being shipped there during that month, while during the same month of last year the number was 615 and the value $1,260,693. During the 7 months' period these exports increased from 4268 cars, valued at $10,547,826, in 1915 to 5655 cars, valued at $13,857,692, in 1916.

Three hundred and thirty-four cars, valued at $605,799, were shipped to the United Kingdom during July last, while during the 7 months of this year the number exported was 6281 and the value $9,857,900. In July a year ago the number of cars exported was 2619 and the value $3,836,296, while during the 7 months of that year the number was 14,494 and the value $21,998,112.

Russia came to the front in July last with orders for 298 cars, valued at $790,443, while during the 7 months' period the number exported there was 1393, valued at $3,991,594. Russia did not figure in the export returns in 1915.

Denmark's importation of American cars in July last numbered eighty-six cars, valued at $64,605, while during the 7 months' period the number was 596 and the value $434,239. That country was not listed separately in the export returns for 1915.

Canada Makes Big Gain

Our exports of cars to Canada show a decided increase. During July last 690 machines, valued at $605,897, were exported there, as against 643 cars, valued at $428,348, shipped in July a year ago, while during the 7 months' period the exports rose from 3961 cars, valued at $3,192,526, in 1915 to 8616 cars, valued at $6,027,295, in 1916.

South American countries are taking kindly to American-built cars. In July a year ago there were 315 cars, valued at $157,964, exported to all the South

(*Continued on page* 461)

Exports of Automobiles, Trucks and Parts for July and 7 Previous Months

	July				7 Months Ending July			
	1915		1916		1915		1916	
	Number	Value	Number	Value	Number	Value	Number	Value
Passenger cars	4,118	$3,835,347	5,258	$3,663,563	22,897	$20,454,354	38,407	$25,897,743
Commercial cars	2,469	6,803,001	1,243	3,062,670	13,428	37,499,768	11,373	30,725,682
Parts, not including engines and tires	.....	1,663,997	.....	1,630,111	.....	7,343,119	.....	13,175,266
	7,587	$12,302,345	6,501	$8,356,344	36,325	$65,297,241	49,780	$69,798,691
By Countries								
Denmark	.....	.....	86	$64,605	.....	.....	596	$434,239
France	615	$1,260,693	538	1,354,968	4,268	10,547,826	5,655	13,857,692
Germany	.....	.....	.....	.....	4	2,800	.....	.....
Italy	16	6,340	4	4,307	108	63,295	226	132,789
Russia	.....	.....	298	790,443	.....	.....	1,393	3,991,594
United Kingdom	2,619	3,836,296	334	605,799	14,494	21,998,112	6,281	9,857,900
Other Europe	1,144	4 033 680	221	279,043	4,822	13,089,008	2,351	3,107,909
Canada	643	428,348	690	605,897	3,961	3,192,526	8,616	6,027,295
Mexico	19	22,001	31	24,683	61	56,306	335	308,221
West Indies and Bermuda	377	197,292	628	407,315	1,704	916,448	3,380	2,124,870
South America	315	157,964	.....	.....	1,212	643,718	.....	.....
Argentina	.....	.....	888	419,512	.....	.....	3,653	1,777 155
Brazil	.....	.....	54	43,116	.....	.....	251	169,732
Chile	.....	.....	125	81,815	.....	.....	551	361,433
Venezuela	.....	.....	84	59,872	.....	.....	361	221,334
Other South America	.....	.....	146	85,494	.....	.....	567	335,376
British East Indies	.....	.....	419	342,226	.....	.....	2,265	1,706,594
British Oceania	382	335,698	.....	.....	2,369	2,046,047	.....	.....
Asia and other Oceania	252	189,227	515	501,349	2,178	4,309,410	4,835	5,987,054
Other Countries	205	170,809	176	175,472	1,144	1,088,626	2,651	1,801,499
Australia	.....	.....	1,264	880,317	.....	.....	5,813	4,420,739
	6,587	$10,638,348	6,501	6,726,233	36,325	57,954,122	49,780	56,623,425

G. M. C. Feature Securities

Reaches New High Record, Setting Mark for New York Stock Exchange

NEW YORK CITY, Sept. 13—General Motors common sold yesterday at $642 a share. This is not only a new mark for the stock itself, but actually sets a high record for the New York Stock Exchange. In the panic of 1901 Northern Pacific sold at $1,000, but that was a quotation forced by a corner.

During the last week securities quotations were slightly off. Firestone Tire & Rubber common which had increased 25 points the week previous fell off this week 30 points. Other tire stocks, however, were stronger, Goodyear increasing by 7 and Kelly-Springfield by 2⅜. In the main all the motor stocks were quite strong. Packard was up 5 and Paige-Detroit up 7.

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Dunlap Leaves Hupp

DETROIT, MICH., Sept. 8—C. H. Dunlap, export manager of the Hupp Motor Car Corp., has resigned to become interested in another enterprise. He has headed the Hupp export business for several years, and is familiar with nearly all of the world's shipping points.

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Truck Makers Draw Together

NEW YORK CITY, Sept. 11—The Cook Attachment Patents, Inc., has been formed here with $10,000 capital to bring into closer relationship manufacturers of attachments for converting passenger cars into commercial vehicles. Albert E. Cook, whose patent No. 1,180,475 on such devices now is in process of litigation in Chicago, heads the company, the other officers elected so far being, president and treasurer, Mark W. Norman, a New York lawyer, and secretary, B. H. Barber. The organization will issue manufacturing licenses under the Cook patents, the Redden Motor Truck Co. at present being the sole licensee.

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Paige May Increase Capital by $1,500,000

DETROIT, Sept. 11—The Paige-Detroit Motor Car Co. will hold a special stockholders' meeting on Sept. 19, at which action will be taken upon a recommendation of the directors that the capitalization of the company be increased from $2,000,000 to $3,500,000, through the issuance of $1,500,000 in preferred stock. On Sept. 2, the Paige company increased the capitalization by the declaration of a 50 per cent stock dividend to holders of record Sept. 9, and the recommended issuance of preferred stock is another step in the company's financing.

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S. S. E. Co. to Build

PHILADELPHIA, PA., Sept. 8—The S. S. E. Co., Philadelphia, has awarded the contract for the first of a series of buildings to be erected in this city. The plant is one story of brick and concrete and measurers 360 by 90 ft. The company will make a $5,000 chassis.

Atlas Forge Declares 100% Dividend

Second Melon Within 10 Days Due to Business Being Twice as Good as in 1915

LANSING, MICH., Sept. 6—For the second time within less than 10 days the Atlas Drop Forge Co. has declared a dividend. The first one was a cash dividend of 20 per cent, while the second one, declared this week, is a 100 per cent stock dividend. The business of the company is said to be more than 100 per cent better now than it was 1 year ago. Two shifts are working at the plant.

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Armstrong Tire Plant to Operate

NEWARK, N. J., Sept. 7—The Armstrong Rubber Co., this city, is equipping its factory in this city for the manufacture of the Armstrong red inner tubes equipped with the Kahn valve.

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Dividends Declared

Directors of the Chandler Motor Car Co. last week declared the regular quarterly dividend of 2 per cent and an extra 1 per cent. This compares with an extra three months ago of ½ of 1 per cent.

Electric Storage Battery Co., quarterly of 1 per cent on preferred and common, payable Oct. 2, to holders of record Sept. 18.

Allis-Chalmers Mfg. Co., quarterly of 1½ per cent on preferred, payable Oct. 16, to holders of record Sept. 30.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1915 Bid	1915 Asked	1916 Bid	1916 Asked	Wk's Ch'ge
Ajax Rubber Co. (new)	..	..	62½	64	—1½
J. I. Case pfd	..	..	83½	84½	+3½
Chalmers Motor Co. com	105	..	145	160	—5
Chalmers Motor Co. pfd	95	100	95	98	..
*Chandler Motor Car Co	..	..	108	109	+5½
Chevrolet Motor Co	..	..	190	193	+2
Fisk Rubber Co. com	..	..	99	106	—11
Fisk Rubber Co. 1st pfd	..	..	107	116	..
Fisk Rubber Co. 2d pfd	..	..	100	110	..
Firestone Tire & Rubber Co. com	530	535	990	1025	—30
Firestone Tire & Rubber Co. pfd	111	..	110	112	—2
*General Motors Co. com	255	256	560	599⅞	+10
*General Motors Co. pfd	113	115	125½	126½	+ ½
*B. F. Goodrich com	61	63	72	72¼	+ ½
*B. F. Goodrich pfd	106	108	113⅛	113⅞	..
Goodyear Tire & Rubber com	284	288	247	252	+7
Goodyear Tire & Rubber pfd	108½	109½	107¼	108	+ ¼
Grant Motor Car Co	..	..	7	8	..
Hupp Motor com	..	..	6	6½	..
Hupp Motor pfd	..	..	80	100	..
International Motor Co. com	27	30	6	10	..
International Motor Co. pfd	56	58	15	20	..
*Kelly-Springfield Tire & Rub. com	204	206½	83¼	83¾	+2⅛
*Kelly-Springfield Tire & Rub. 1st pfd.	89	91	99	100	+4
*Lee Rubber & Tire Corp	..	..	47½	48	+1¾
*Maxwell Motor Co. com	42	43	81⅝	..	—1⅜
*Maxwell Motor Co. 1st pfd	86	87	83¼	83¾	—1¾
*Maxwell Motor Co. 2d pfd	36	37	52½	54	—2
Miller Rubber Co. com	190	194	223	237	+3
Miller Rubber Co. pfd	107½	..	104	106	—1
Packard Motor Car Co. com	120	130	165	175	+5
Packard Motor Car Co. pfd	100	..	..	100	..
Paige-Detroit Motor Car (old)	..	450	53	56	+7
Peerless Truck & Motor Corp	..	..	23½	24½	+ ½
Perlman Rim Corp	..	..	..	..	..
Portage Rubber Co. com	46	48	152	156	+2
Portage Rubber Co. pfd	93	94	150	155	..
Regal Motor Co. pfd	..	21	20	25	+3
Reo Motor Truck Co	17	17¾	44	45	+7¾
Reo Motor Car Co	32	33½	44	45	+3¼
Saxon Motor Car Co	..	..	72	75	+1½
Standard Motor Co	..	..	6	7	— ½
Stewart-Warner Speed. com	65	66	114	115	+3
Stewart-Warner Speed. pfd	105	107	..	..	..
*Studebaker Corp. com	114	116	123⅞	124½	+ ⅛
*Studebaker Corp. pfd	105	106	109	110	+1½
Swinehart Tire & Rubber Co	88	90	92	95	—3
United Motor Corp	..	..	61⅜	61⅞	—15⅝
*U. S. Rubber Co. com	48¾	50	58	58¼	+1
*U. S. Rubber Co. pfd	103⅞	105	111¼	112	+1¼
White Motor Co. (new)	110	..	53	54	+1½
*Willys-Overland Co. com	187	189	47⅞	48	+5⅜
*Willys-Overland Co. pfd	107½	108	103¼	105	..

*At close Sept. 11, 1916. Listed New York Stock Exchange.
Quotations by John Burnham & Co.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1915 Bid	1915 Asked	1916 Bid	1916 Asked	Wk's Ch'ge
Auto Body Co	..	..	36¾	..	..
Chalmers Motor Co. com	103	..	..	151	..
Chalmers Motor Co. pfd	95	97	..	103	..
Continental Motor Co. com	..	300	35	35¾	..
Continental Motor Co. pfd	84	..	9½	10½	..
Ford Motor Co. of Canada	..	1525	305	330	..
General Motors Co. com	259	263	545	585	+40
General Motors Co. pfd	114	116	126	129	+1
Maxwell Motor Co. com	42	44	83½	86½	+1
Maxwell Motor Co. 1st pfd	86	89	84½	87½	+ ½
Maxwell Motor Co. 2d pfd	36	39	55	58	+1
Packard Motor Car Co. com	120	130	165	171	..
Packard Motor Car Co. pfd	100	101	..	102	..
Paige-Detroit Motor Car Co	..	450	49	52	—3½
W. K. Prudden Co	20½	22	44	45½	+1½
Reo Motor Car Co	33	33¾	44½	45½	+2¾
Reo Motor Truck Co	16¾	17½	44⅝	45½	+8⅜
Studebaker Corp. com	114	116	122	125	..
Studebaker Corp. pfd	104	107	105	..	..
C. M. Hall Lamp Co	..	..	25	30	..

INACTIVE STOCKS

Atlas Drop Forge Co	29	31	35	..	+5
Kelsey Wheel Co	205	..	55	60	..
Regal Motor Car Co. pfd	..	21	18	..	+1

Fosters Trade with Argentina

American Commercial Club of Buenos Aires To Give Information

BUENOS AIRES, Aug. 6.—Automobile concerns doing business in Argentina can be greatly assisted by the American Commercial Club, an organization of U.S.A. business men in this city. This commercial club has as its object the improving of trade relations with the United States of America. Recently this club has associated itself with the United States Chamber of Commerce, Washington, D. C., and has established itself as a clearing house for information of U.S.A. manufactures of all kinds.

In addition to being prepared to give any U.S.A. manufacturers information regarding any conditions in Argentina, the American Commercial Club is playing the rôle of an arbitration board for the purpose of adjusting complaints made by Argentine merchants against firms in the United States. These complaints are often due to delayed shipments, goods not corresponding with samples, etc. In a word, this club is endeavoring to facilitate and improve the commerce between the two countries, all of which is highly necessary if U.S.A. is to secure that control of the Argentine trade which it should.

In carrying on this work the American Commercial Club is put to considerable expense, the cost being approximately $10,000 a year. The business merchants here, who are members of the club, are willing to give their time and some of their money for the purpose of carrying on this work, but cannot meet the entire financial responsibility. U.S.A. automobile manufacturers who are now intensely interested in Argentine can assist by subscriptions of $25 or more per year. It is possible to obtain memberships in the chamber for a nominal sum, and thus get advantage of all information collected by it. The officers of the club are all U.S.A. people, and hold responsible positions in the city. They all hold power of attorney for their respective companies and represent the best business blood of the U.S.A. in Argentina.

The officers and directors are: President, J. L. Wheatley; vice-president, Louis C. Young; secretary, Alfred Eichler; treasurer, A. T. Brooks; and governors H. E. Finney, W. J. Pilant, and S. D. Allchin. Mr. Finney is manager of the Armour meat packing industry, which has the most modern slaughter-house in the world; and Mr. Pilant is manager of the International Harvester interests for Argentina, Chile, Brazil, Uruguay and other parts of South America.

The club is located in the Plaza Hotel, Buenos Aires.

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Vail Tractor Uses Gasoline or Kerosene

HAMILTON, OHIO, Sept. 8 — The Vail-Rentschler Tractor Co., Hamilton, now being organized with an authorized capital of $100,000 to build and market the medium weight Vail tractor, which will operate with either gasoline or kerosene. The incorporators and stockholders are: G. A. Rentschler, chairman, of the Hooven, Ownes, Rentschler Co.; Col. C. B. Wing of Cincinnati; J. A. Vail, formerly chairman of the board of directors of the Maxwell Motor Co.; G. S. Rentschler, vice-president of the Hamilton Foundry and Machine Co., and C. Vail of Chicago.

A plant is now being equipped opposite the Butler County Fair Grounds in Hamilton.

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Materials Market Steady

NEW YORK CITY, Sept. 13—No important changes were recorded in the materials market during the past week. Aluminum held its 60 cents a pound level, due to the great demand among automobile manufacturers. Fine up-river Para rubber advanced 2½ cents per pound. Tin, which has been falling off in price for the last 2 weeks, has dropped another 75 cents per 100 lb., being down to $38 even at the market close on Monday. The copper prices, which have been 28 cents for some time, are steady.

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thur.	Fri.	Sat.	Mon.	Week's Ch'ge
Aluminum, lb.	.60	.60	.60	.60	.60	.60	...
Antimony, lb.	.12¼	.12¼	.11½	.11½	.11½	.11½	— ¼
Beams & Channels, 100 lb.	2.76	2.76	2.76	2.76	2.76	2.76	— .01
Bessemer Steel, ton.	45.00	45.00	45.00	45.00	45.00	45.00	...
Copper, Elec., lb.	.28	.28	.28	.28	.28	.28	...
Copper, Lake, lb.	.28	.28	.28	.28	.28	.28	...
Cottonseed Oil, bbl.	10.00	10.13	9.90	9.85	9.76	9.70	...
Fish Oil, Menhaden, Brown, gal.	.58	.58	.58	.58	.58	.58	...
Gasoline, Auto, bbl.	.22	.22	.22	.22	.22	.22	— .01
Lard Oil, prime, gal.	1.00	1.00	1.00	1.00	1.00	1.00	...
Lead, 100 lb.	6.70	6.70	6.70	6.70	6.70	6.70	...
Linseed Oil, gal.	.72	.70	.70	.70	.70	.69	— .03
Open-Hearth Steel, ton.	45.00	45.00	45.00	45.00	45.00	45.00	...
Petroleum, bbl., Kans., crude	.90	.90	.90	.90	.90	.90	...
Petroleum, bbl., Pa., crude	2.30	2.30	2.30	2.30	2.30	2.30	...
Rapeseed Oil, refined, gal.	.90	.90	.90	.90	.90	.90	...
Rubber, Fine Up-River Para, lb.	.69½	.73	.72	.72	.72	.72	+ .02½
Rubber, Ceylon, First Latex, lb.	56½	.57	.57	.57	.57	.57	+ ½
Sulphuric Acid, 60 Baume, gal.	1.50	1.50	1.50	1.50	1.50	1.50	...
Tin, 100 lb.	39.00	39.00	38.87½	38.75	38.75	38.00	— .75
Tire Scrap, lb.	.05⅜	.05⅜	.05⅜	.05⅜	.05⅜	.05⅜	...

Hupp Car Averages 18.96 M. P. G.

301 Miles, Albany to Buffalo, in Test—1204 M. P. G. of Oil Used

COLUMBUS, OHIO, Sept. 12—The Hupmobile car, which is making a capital-to-capital tour throughout the United States, arrived in Columbus, its twelfth State capital, this evening from Cleveland. After pausing at the capitol building and visiting the local dealers, the party left for Xenia on the way to Frankfort, Ky. The car is going by way of Cincinnati, and after leaving Frankfort will go to Indianapolis.

On the way from Albany to Buffalo an economy test under the sanction of the American Automobile Assn. was made, and on the 301 miles the average fuel consumption was 18.96 miles per gallon. The average mileage per gallon of oil was 1204, and per gallon of water 602. The only work done on the car between Albany and Buffalo was to clean the dirt from the bottom of the spray nozzle. The A. A. A. has guaranteed the stock status of the car which corresponds to catalog dimensions in all respects. In equipment a spotlight is carried and Goodyear all-weather tread tires are used on the front wheels as well as the rear. The amount of gasoline used on the trip was 15 gal. and 7 pt.; oil, 1 qt., and water, 2 qt. An overnight stop was made at Syracuse, which is about midway between Albany and Buffalo. The roads are in excellent condition and the country of a rolling nature.

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Gaso-Kerosene Tractor Embodies Many Features

LODI, WIS., Sept. 9—The first models of a new gaso-kerosene tractor manufactured by E. J. McFarland and J. C. Westmont, Lodi, Wis., are now being exhibited at state and county fairs and given demonstrations on northwestern farms. The tractor is an assembled machine, the units being purchased from specialists. The use of a Bennett carbureter makes it possible to use gasoline, kerosene, distillate or motor spirits as fuel. The tractor pulls three 14-in. plows and has belt power for 18-in. silage cutters and 28-in. threshers. A 50-hp. motor also is furnished. The engine is a Waukesha, with Eisemann magneto and Perfex radiator. The builders also use Clark universals, Foote gears, and Hyatt bearings. The axles, frame, wheels and drawbar are provided by the Electric Wheel Co., Quincy, Ill., and the clutch is a Borge & Beck dry disk. The universals are unique, being of the steamship type and new to tractor design.

Astor Cup Will Be 250 Miles

Sept. 30 Event Carries $25,000 in Prizes—To Start at 2.30 P. M.

NEW YORK CITY, Sept. 8—The Astor Cup Race will be held on the 2-mile Sheepshead Bay Speedway here on Saturday, Sept. 30. The race will be for 250 miles instead of 350 as used last year. The shorter distance has been selected to increase the popularity of the event. With 250 miles it will be possible to start the race at 2:30 p. m., thus giving all Saturday afternoon holidayers an opportunity of witnessing the start and the entire race.

The prizes total $25,000, or at the rate of $100 per mile. This is divided as follows:

First prize...	$10,000	Sixth prize....	$1,200
Second prize.	5,000	Seventh prize..	1,000
Third prize...	2,500	Eighth prize...	900
Fourth prize.	1,600	Ninth prize....	800
Fifth prize...	1,300	Tenth prize....	700

For some time there has been some question as to whether this race would be held or not because of certain internal troubles with the track organization. These were all clarified at a meeting yesterday when complete arrangements for the race were perfected.

No list of entries has as yet been compiled, but promises are on hand for fourteen entrants and it is expected that the usual elimination trials will be held previous to the race so as to reduce the field to meet the speedway requirements.

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U. S. A. Cars Popular in South Africa

(*Continued from page* 455)

to the houses handling them. There are some houses that have rather unsavory reputations in that country and it is certain the sale of products is going to suffer because of such. In South Africa, the same as in Australia and South America, the motor car trade is sufficiently large to warrant our manufacturers dealing direct with the large houses in that country.

Light Car Opportunities

There is a good chance in British South Africa, according to Mr. Campbell, for a U. S. A. light-type car, built on the lines of the English Singer. It should be a two-seater that would sell for $1000 and show 35 miles per gallon of gasoline. Such a car would have to have good lines and be well built.

Owing to the high price of gasoline there is a good demand for electric passenger and commercial vehicles. With gasoline at 88 cents per gallon and electricity at 2 cents per kilowatt, there is good opportunity, particularly in Johannesburg for selling electrics.

At present the commercial vehicle business in Johannesburg is largely confined to fitting delivery bodies on such chassis as Overland, Studebaker, Maxwell, Ford, etc. Much of this has been done in the past year and the market is increasing.

Johannesburg is destined to be the great motor car distributing center for British South Africa. It has by far the largest population and is surrounded by a productive country. The city is located on a plateau 6000 ft. high, 1000 ft. higher than Denver, Col., and has a climate practically the same as Los Angeles. Some of the staples in the surrounding country are corn, cotton, tobacco, oats, other cereals, and fruits.

At present business conditions are very satisfactory. Immediately after the opening of the war there was a shrinkage of general business for a few months, but since then prices have been so good that the country is more prosperous than in times of peace.

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6501 Cars and Trucks Exported in July

(*Continued from page* 458)

American countries, while during the 7 months' period of that year the number was 1212 and the value $643,718. This year these exports have increased in value to such an extent that the leading countries of South America have been listed separately in the export returns. Argentina's importations of cars in July last amounted to 888 cars, valued at $419,512, while during the 7 months of this year the number was 3653 and the value $1,777,155. The cars shipped to Chile in July last numbered 125 machines, valued at $81,815, while during the 7 months' period the number was 551 and the value $361,433. Brazil's importations numbered fifty-four cars, valued at $43,116, in July and 251 cars, valued at $169,732, during the 7 months' period. The shipments to Venezuela in July amounted to eighty-four cars, valued at $59,872, and during the 7 months to 361 cars, valued at $221,334. Shipments to other South American countries amounted to 146 cars, valued at $85,494, in July and to 567 cars, valued at $335,376, during the 7 months of this year.

Substantial gains are also noted in the export returns to British East Indies, Australia, Asia and other Oceania.

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Pettit Resigns from Case

RACINE, WIS., Sept. 8—B. M. Pettit, for 3 years advertising manager of the J. I. Case T. M. Co., Racine, Wis., has resigned to accept an executive position with the Curtis Publishing Co., at Philadelphia.

11 Owen-Magnetics on 5-Day Tour

R. M. Owen Host to Over 50 on Trip Through New England Hills

NEW YORK CITY, Sept. 13—Inviting over fifty men to go as his guests on a 5-day tour through the best touring sections of New England, R. M. Owen of this city added a second chapter to his original move started a year ago. These fifty men were carried in eleven Owen-Magnetic cars furnished by Mr. Owen, who took control of the Entz patents 5 years ago and since has been developing and perfecting the Entz system as used in the Owen-Magnetic cars. Mr. Owen paid all the expenses of all his guests.

A year ago Mr. Owen conceived the idea of an invitation tour, inviting those people he wished to demonstrate his car to go along and see the electric-magnetic transmission system operate on the roads, on the hills and under all touring conditions. He went further and gave many of his guests opportunities to drive the cars on the trip. Last year three small trips were staged and they proved so successful that a 5-day tour with eleven cars was successfully carried out this year. The tour ended in this city today and was most successful.

Among the fifty invited guests were several Owen-Magnetic private owners who drove their own cars, several Owen-Magnetic dealers from New York, Philadelphia, Boston and other cities who drove their cars and brought friends along, and also many of the officials of the Baker R. & L. Co., Cleveland, which is manufacturing two models of the Owen-Magnetic cars. The party included Chas. L. F. Wieber, president of the Baker R. & L. organization; J. B. Entz, Sr., inventor of the Owen system; Stephen Bourne of Philadelphia, who is manufacturing a truck using the Owen system, etc. The class and daily press was well represented.

180 Miles a Day

Approximately 180 miles per day were covered on the tour, the itinerary including New York City, through the Berkshires by way of Pittsfield and Greenfield, and thence to the White Mountains by way of Franconia, thence back to Boston and to New York via Springfield and Hartford.

The tour offered two exceptional hill-climbing tests, one over the famous Mohawk trail near North Adams, Mass., over a road built 2 years ago, and one that is looked upon as one of the best climbs in New England. There is 7 miles of climbing with a sharp S turn in the steepest part. The road in many places

is cut into the solid rock in the mountain side.

The other hill-climb was up what is known as 3-mile climb near the Profile House in Franconia, the heart of the White Mountains. This climb is steeper than that over the Mohawk trail, and is over a rather poor road through the wooded mountain. The road rises in a series of very rapid climbs, with several water breaks.

A Severe Test

The hill-climbing ability of the electric transmission received its severest test. The cars demonstrated that the electric-magnetic system possesses superior qualities for this kind of work. The fact that the power is applied continuously when changing from one electric position to another and that there is not a moment when the power of the motor is cut off from the rear wheels proved a real factor in hill-climbing. This continuous power is quite apparent in such severe hill-climbing work. Not only is there the advantage of the continuous power, but the absence of any mental problem in connection with gear shifting. That problem is quite eliminated, for it is as easy to shift from one electrical position to another as to move the throttle lever on the steering wheel.

Mr. Owen has provided in his cars for such severe hill-climbing work a lower gear ratio, which was used by practically all of the drivers. On this lower ratio it was possible to make the ascents with good motor speed and have the electric-magnetic transmission system in what would correspond to a high-speed position in a sliding gearset. The cars always had several reserve electrical positions for the work.

Electric Brake's Value

The mountain work of the trip demonstrated the value of the electric brake which, when applied, immediately slows the car to 15 miles per hour. This brake is applied by the small lever on the steering wheel by which you start the motor, give the different electrical connections for the gearset and apply the electrical brake, all three on a lever but little longer than the throttle lever generally used. The electrical brake is not only easy to operate, but conserves the two sets of rear wheel friction brakes very materially. There was not a single instance of any trouble with the electric-magnetic systems of the cars on the entire trip.

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Slaker Stover Sales Mgr.

JANESVILLE, WIS., Sept. 9 — C. S. Slaker, head of the sales department of the Janesville Machine Co., Janesville, Wis., has resigned to become general sales manager of the Stover Engine & Mfg. Co., Freeport, Ill., which is the recent consolidation of the Stover Engine Works and Stover Mfg. Co.

Trucks Transport 2000 Troops

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Carry Men and Equipment 200 Miles in 32 Hours—Use 132 Motor Trucks

SAN ANTONIO, TEXAS, Sept. 8—One of the most notable tests of army motor trucks was finished this morning when two thousand men and officers and equipment of the First and Second Kansas Infantry regiments arrived at Fort Sam Houston from Eagle Pass. The distance of approximately two hundred miles by the route traveled was covered in thirty-two hours actual running time. The transportation train consisted of 132 motor trucks. It is stated that this movement establishes a new record for rapid overland transportation of troops. Two all-night camps were made on the trip—one at La Pryor and the other at Castroville. The finish to Fort Sam Houston could easily have been made last evening, but it was decided to spend the night at Castroville, about thirty miles out, and bring the troops into camp fresh this morning.

Major General G. Frederick Funston met the troops at Castroville last evening. He expressed himself as delighted with the success of the truck movement.

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Maxwell Earnings Gain 135 Per Cent

(*Continued from page* 425)

well Motor Co., Inc., during the past fiscal year shows an increase of 88 per cent over the sales of previous year. The manufacturing facilities of the factories at Dayton, Ohio, Newcastle, Ind., and Detroit, Mich., have been increased so that the company is now in position to produce more than 100,000 cars per annum.

Sales in August, 1916, the first month of the present fiscal year, show a substantial increase over the same period last year.

Consolidated General Balance Sheet of the Maxwell Motor Co. Inc.

ASSETS

CAPITAL ASSETS:			
Real Estate, Buildings, Machinery and Equipment, at July 31, 1915	$5,192,625.86		
Additions during the year (Net)	553,909.64		
	$5,746,535.50		
Less—Reserve for Depreciation	1,580,373.40	$4,166,162.10	
Investments in other Properties		1,300,603.64	$5,466,765.74
GOODWILL, PATENTS, MODELS, TRADE MARKS AND TRADE NAMES		$26,500,000.00	
Less—Amount of Surplus appropriated for retirement of First Preferred Capital Stock		309,530.46	26,190,469.54
CURRENT WORKING ASSETS:			
Inventories		$8,971,355.84	
Accounts Receivable		743,325.37	
Notes Receivable		395,056.75	
Mortgage Receivable—Due on Contract of Sale		167,500.00	
Cash	$3,269,552.50		
Sight Drafts, with Bills of Lading attached, out for collection	1,597,095.13	4,866,647.63	
		$15,143,885.59	
Less—Reserve for Accounts Doubtful of Collection		131,769.12	15,012,116.47
SINKING FUND—Central Trust Company of New York, Trustee:			
Cash		$8,283.25	
Securities (First Preferred Voting Trust Certificates)		163,606.00	171,889.25
Total			$46,841,241.00

LIABILITIES

CAPITAL LIABILITIES:			
First Preferred		$13,764,120.51	
Second Preferred	$11,000,000.00		
Less—In Treasury	872,532.01	10,127,467.99	
Common	$13,000,000.00		
Less—In Treasury	221,942.42	12,778,057.58	
		$36,669,646.08	
Dividend Warrants—First Preferred Stock		279,741.75	$36,949,387.83
DEFERRED LIABILITIES:			
Real Estate Mortgage			12,709.46
CURRENT LIABILITIES:			
Accounts Payable—Audited Vouchers		$1,226,715.98	
Accounts Payable—Unvouchered Invoices		696,176.77	
Wages—Accrued		124,107.32	
Taxes, Insurance, Etc.—Accrued		98,651.29	
Customers' Deposits		483,016.10	
Due on Contracts, Etc.		735,409.93	
Sight Drafts on Customers—Discounted		944,290.96	4,308,368.35
RESERVE FOR CONTINGENCIES			60,000.00
CORPORATE SURPLUS:			
Undivided Surplus—July 31, 1915		$3,171,794.00	
Net Income for the Year Ended July 31, 1916		5,426,635.59	
		$8,598,429.59	
Deductions—			
Dividends declared and paid on First Preferred Stock during the year	$2,750,013.02		
Sinking Fund Appropriation	137,641.21		
Inventories Reduced	200,000.00	3,087,654.23	5,510,775.36
Total			$46,841,241.00

Aitken Makes Clean Sweep

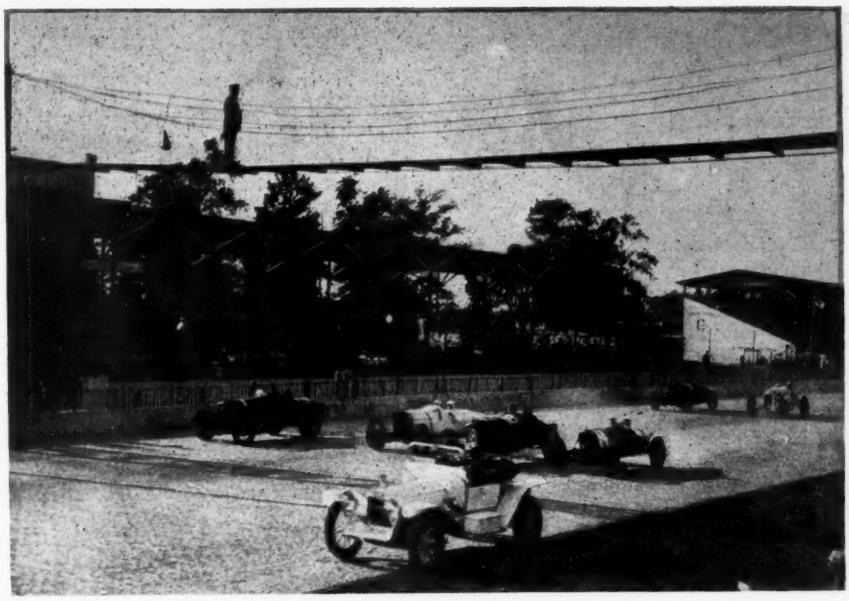
Takes 20, 50 and 100-Mile Hoosier Events — Rickenbacher Breaks Wheel

INDIANAPOLIS SPEEDWAY, Sept. 9 — Johnny Aitken won all three races here to-day. Going into the 100-mile event, the third on the card, after having taken both the 20-mile and 50-mile dashes, his Peugeot showed the way, and with the confidence gained in his two earlier wins, Aitken jumped into the lead. However, Rickenbacher had kept his Maxwell out of the first two races purposely to save it for the one in which points toward the season's championship were to be awarded. Aitken found Rick crowding him hard and it was a battle royal between the two, who paced the field and kept well in the lead most of the time.

Aitken lead, but never for more than 100 ft., up to the end of the twenty-third lap, when Rickenbacher plunged out in front for one circuit of the track, Aitken heading him on the next circuit. Aitken held the lead until the thirty-third lap, then Rickenbacher led for one circuit, Aitken going into the lead again for two laps, or up to the 90-mile post.

It was on the next lap after this that the steering arm on the right wheel of the Peugeot broke and Rickenbacher began to walk away from Aitken as if the latter was tied. Pit attendants had signalled Rick to watch his right rear wheel, which was wobbling considerably and proved his undoing just when victory seemed within his reach, for Aitken was in serious trouble.

With but little more than 5 miles to go and when he was leading Aitken by almost a mile, Rick came out of the west turn into the homestretch at high speed and his right rear wheel collapsed and this caused the left rear tire to go. Much credit is due Rickenbacher for his masterly control of the Maxwell under these conditions. His car careened first right, then left, then right again and just when four cars seemed about to hit him broadside, for he was directly across the track, the Maxwell began sliding backwards and just in the nick of time gave the right of way to the cars bearing down upon it. Rickenbacher and his mechanic, George Henderson, were in their seats when the car came to a standstill and the cheers that greeted them as they walked to the pits was equal to that ever accorded any winner. Aitken drove the last eight miles with only one



Start of 100-mile race at Indianapolis. Carl Fisher is pacing the field in a Packard

Times for the 20-Mile Event

Car	Driver	10 Mi.	20 Mi.	Speed	Prize
Peugeot	Aitken	6:26.54	12:37.35	95.08	$400
Premier	Wilcox	6:26.94	12:37.68	95.03	300
Sunbeam	Chevrolet	6:41.65	13:12.88	90.81	200
Hoskins	Hughes	6:55.36	13:36.90	88.74	100
Premier	Lewis	7:09.80	14:03.85		
Peugeot	De Palma	7:16.00	14:04.62		
Duesenberg	Buzane	7:10.90	14:11.34		
Ostewig	McNey	7:32.96	15:52.18		

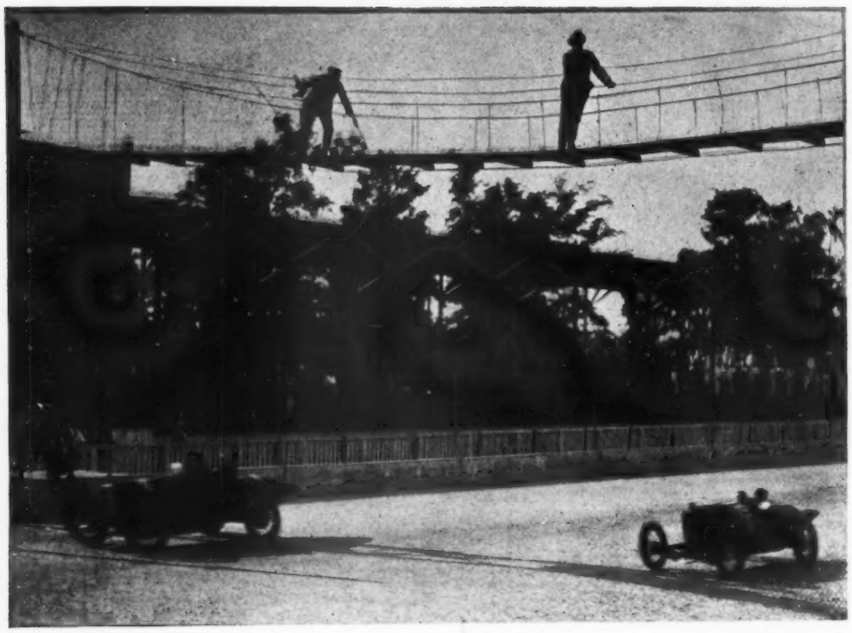
Henderson and Klein both out early.

Times for 50-Mile Event

Car	Driver	10	20	30	40	50	Speed	Prize
Peugeot	Aitken	6:36.92	13:11.19	19:42.45	26:12.91	32:40.33	91.83	$700
Hoskins	Hughes	6:37.50	13:11.95	19:44.42	26:14.60	32:40.61	91.81	500
Sunbeam	Chevrolet	6:37.26	13:12.58	19:44.95	26:15.03	32:41.10	91.79	400
Duesenberg	D'Alene	6:38.38	13:19.33	20:00.40	26:38.57	33:25.85	89.75	300
Premier	Lewis	6:57.92	13:43.96	20:31.52	27:12.70	34:05.46	87.99	100
Premier	Wilcox	6:36.55	13:11.19	20:55.68	28:44.00	35:24.89		
Duesenberg	Buzane	7:14.60	14:15.67	21:25.55	28:25.68	35:32.87		
Peugeot	De Palma	Out—Dirty plugs—7th lap						
Duesenberg	Klein	Out—Dirty plugs—7th lap						

Times Every 10 Miles in the 100-Mile Event

Car	Driver	10	20	30	40	50	60	70	80	90	100	Speed	Prize
Peugeot	Aitken	6:29.92	13:04.37	19:47.75	26:31.93	33:16.90	39:59.40	46:39.99	53:25.25	59:51.84	1:07:05.04	89.44	$3500
Hoskins	Hughes	6:43.69	13:27.15	20:14.17	27:17.80	33:58.45	40:38.54	47:22.20	54:08.60	1:00:50.24	1:07:24.96	89.01	2000
Duesenberg	D'Alene	6:45.54	13:34.96	20:12.72	26:52.89	33:35.53	40:13.47	46:52.28	53:40.88	1:00:40.73	1:07:43.73	88.60	1200
Duesenberg	Buzane	7:02.21	13:57.45	21:07.62	27:59.80	34:44.50	41:32.28	48:21.45	55:06.66	1:01:47.54	1:08:37.66	87.44	1000
Premier	Lewis	7:01.31	13:47.76	20:33.71	27:17.34	34:01.39	40:50.44	48:49.89	55:31.21	1:02:17.71	1:09:07.30	86.81	600
Omar	Toft	7:16.90	14:28.15	21:59.34	29:16.93	36:30.75	43:48.13	51:07.40	58:24.30	1:05:35.19	1:12:40.80	82.56	400
Maxwell	Henderson	7:06.88	14:11.75	21:33.21	28:58.89	36:18.78	43:42.84	51:03.57	58:22.70	1:05:36.41	1:12:43.45	82.51	300
Peugeot	De Palma	7:01.66	13:56.60	21:06.65	27:58.17	34:43.30	.....	49:21.83	56:26.54	1:05:49.61	1:13:12.62	81.96	
Maxwell	Rickenbacher	6:30.37	13:04.93	19:48.56	26:32.36	33:17.44	39:59:72	46:40.59	53:25.85	59:52.27	Wrecked 38th lap		
Ostewig	McNey	7:49.17	15:49.76	23:51.30	31:57.30	39:42.68	47:45.68	55:36.35	1:03:37.71	Flagged, 36th lap			
Premier	Wilcox	6:56.48	15:22.58	21:59.62	29:50.90	Out 8th lap, quit							
Duesenberg	Milton	6:50.36	14:04.46	Out 8th lap, ignition trouble									



Aitken and Hughes in sensational finish of 50-mile event, 27/100 seconds apart

front wheel attached to his steering apparatus.

Attendance Not Large

Indianapolis appeared to have been surfeited with entertainment, the State fair having closed yesterday, for there did not seem to be over 10,000 to 12,000 present at the races, which were the fastest ever seen on the Indianapolis track up to the time Aitken broke his steering knuckle and had to slow down. At that the 100-mile dash was considerably faster than the 300-mile event last Memorial Day and nearly equalled De Palma's speed when he won last year. The 20 and 50-mile events were won at 95.08 and 91.83 miles per hour, respectively.

The 100-mile race was characterized by two battles, that of Rickenbacher and Aitken and one between D'Alene and Hughes. From the thirtieth to the ninetieth mile Hughes had been fighting D'Alene for third place and when Rickenbacher wrecked Hughes jumped into Rick's place, passing D'Alene in the home stretch.

George Buzane, one of the surprises of the Cincinnati derby, where he won fourth place, repeated to-day. He had the pole position at the start, having drawn No. 1, and was soon in eighth place after the race started. However, at the end of 20 miles Milton docked his Duesenberg with ignition trouble and Buzane jumped into seventh place, just inside the prize money. De Palma's and Lewis' stops for tires at the 72-mile point gave Buzane fifth position and the falling of Rickenbacher put him in fourth, where he finished.

In the 20-mile event Aitken took the lead from the start and won at 95.08 miles per hour, although Wilcox gave him a hard battle, finishing only 0.33 sec. behind. Chevrolet drove the Sunbeam that Galvin took third money in at Cincinnati last Monday into third place.

In the 50-mile dash Wilcox, in a Premier, lead the field for six laps, then gave way to Aitken. Hughes lead the field in the fifteenth lap, but relinquished it to Aitken after one circuit of the track, but crowded the Peugeot close and finished 0.27 sec. behind Aitken.

It was an afternoon of spectacular finishes for each race. Not more than a car length decided between first and second places in the 20 and 50-mile events, and then in the 100-mile race Aitken stopped at the first pit on his last lap, coasting across the line when he got the checkered flag. Ralph De Palma, who drove Merz's Peugeot, kept running, but said after the race that it seemed to want to climb over the rail all the time. It seemed odd to see De Palma in the Peugeot blue; it made one lonesome for the Mercedes, which was too badly broken at Cincinnati last Monday to participate here. Christiaens did not start, his Sunbeam being disabled.

Aitken used Oilzum in the Cincinnati race last week instead of castor oil, as reported.

Specifications and Details of Equipment of Cars Entered in the Harvest Racing Classic at Indianapolis, Sept. 9

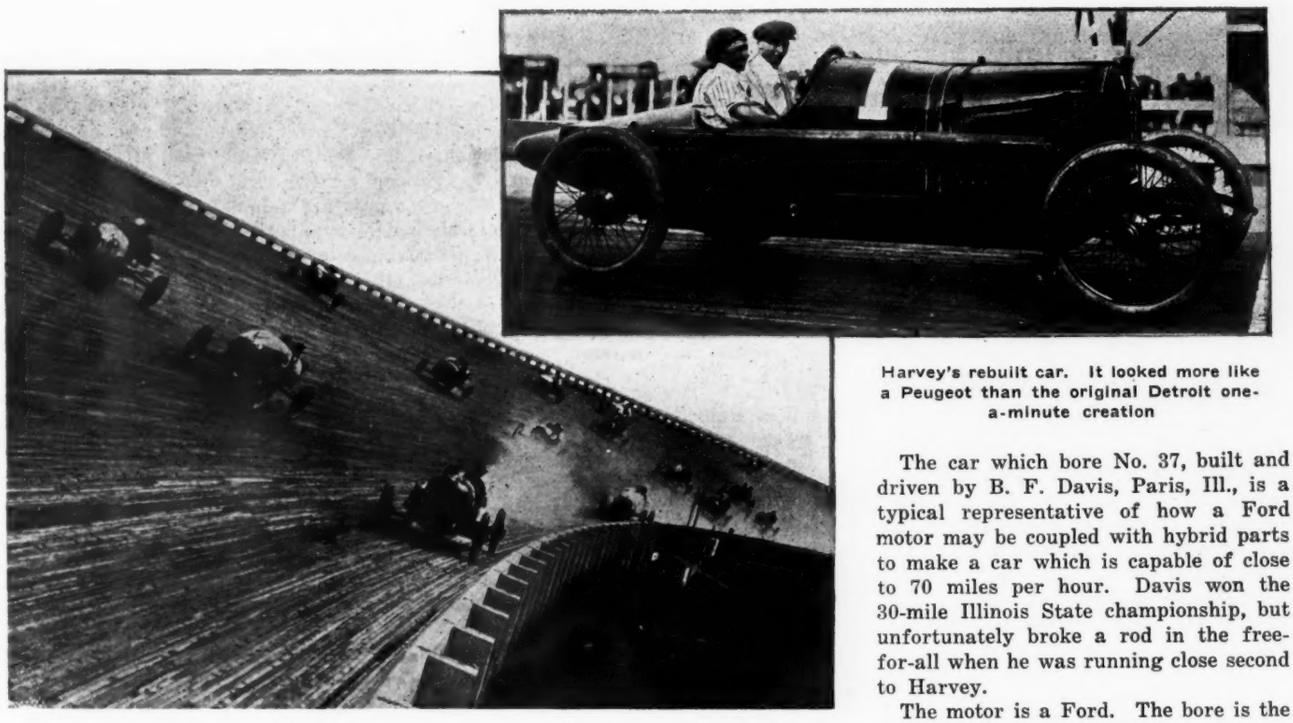
Car	Driver	Bore	Stroke	Dis.	Carb.	Ignition	Plugs	No. Plugs	No. Valves	Valve Location	TIRES		Wb.	Wheels	Pistons	Oil	Shock Absorbers	Other Equipment
											Make	Size						
Peugeot	De Palma	3.70	6.65	274.0	Zenith	Bosch	K L G	4	16	Over	Silvertown	35x5	106	R.-W.	Levett	Oilzum	Hartford	Moto-Meter
Premier	Wilcox	3.65	6.63	274.5	Miller	Bosch	K L G	4	16	Over	Goodyear	33x5	105	R.-W.	Levett	Oilzum	Hartford	Moto-Meter
Omar	Toft	3.75	6.75	298.2	Miller	Bosch	Rajah	8	16	Side	Goodyear	35x5	106	R.-W.	Levett	Oilzum	Hartford	Moto-Meter
Peugeot	Aitken	3.65	6.65	274.0	Zenith	Bosch	K L G	4	16	Over	Goodyear	35x5	106	R.-W.	Aluminum	Oilzum	Hartford	Moto-Meter
Maxwell	Rickenbacher	3.75	6.75	298.2	Miller	Bosch	K L G	4	16	Over	Silvertown	35x5	106	Houk	Levett	Castor	Hartford	Moto-Meter
Duesenberg	D'Alene	3.75	6.75	298.2	Miller	Bosch	Rajah	8	16	Side	Silvertown	33x5	106	R.-W.	Levett	Oilzum	Hartford	Moto-Meter
Maxwell	Henderson	3.75	6.75	298.2	Miller	Bosch	K L G	4	16	Over	Goodyear	33x5	106	Houk	Levett	Castor	Hartford	Moto-Meter
Sunbeam*	Chevrolet	3.28	6.14	294.2	Miller	Thomson	K L G	6	24	Over	Silvertown	35x5	113	R.-W.	Alum.Al.	Castor	Hartford	Moto-Meter
Duesenberg	Milton	3.75	6.75	298.2	Miller	Bosch	Rajah	8	16	Side	Silvertown	33x5	106	R.-W.	Levett	Oilzum	Hartford	Moto-Meter
Duesenberg	Buzane	3.75	6.75	298.2	Miller	Bosch	Rajah	8	8	Side	Silvertown	33x5	106	R.-W.	Levett	Oilzum	Hartford	Moto-Meter
Duesenberg	Klein	3.75	6.75	298.2	Miller	Bosch	Answer	8	16	Side	Silvertown	33x5	106	R.-W.	Levett	Mobiloil	Hartford	Moto-Meter
Hoskins	Hughes	3.75	6.75	298.2	Miller	Bosch	Rajah	8	16	Side	Silvertown	35x5	106	R.-W.	Aluminum	Monogram	Hartford	Moto-Meter
Premier	Lewis	3.65	6.63	274.5	Miller	Bosch	K L G	4	16	Over	Silvertown	35x5	105	R.-W.	Levett	Oilzum	Hartford	Mso-Mreot
Osteweg	McNey	3.34	5.00	295.2	Miller	Bosch	Rajah	8	16	Side	Silvertown	33x5	102	Houk	Magnalite	Oilzum	Hartford	Moto-Meter

*Six cylinders; all others four cylinders.

How the Ford Racers Were Rebuilt

Some Resembled Peugeots and Others Wired Together

By Wallace Blood



Taking the steeply banked curve on the Chicago track. The rebuilt Fords sailed high up on the incline

Harvey's rebuilt car. It looked more like a Peugeot than the original Detroit one-a-minute creation

CHICAGO SPEEDWAY, Sept. 10 — Hay wire, binding twine, trunk straps, junk parts and mechanical ingenuity, combined with more-or-less semblances of Ford cars, went to make up the creations which took part in the Ford race to-day, and a more motley assortment of reconstructed flivvers has never been seen. The springs were underslung and overslung—two cars were entirely without springs. There were distributers, special magnetos and ordinary Ford magnetos, cast-iron pistons and aluminum pistons, skeleton bodies and streamline racing types. Even that which was previously considered impossible was accomplished. Fords were disguised so that all evidence of their birthright was effaced.

The greatest interest hinged on car No. 1, which took first money in two of the races and showed close to 80 miles an hour in practice. It is a Bob Burman and Jack Gable designed replica of a Peugeot, built in his father's garage at Oak Park, Ill., by Paul Harvey, the driver. It was this garage in which Burman and Gable kept their cars prior to the 1915 Chicago race and credit is given them for much of the car's design. The car got into the race because it has a Ford block, gearset and axle. Otherwise it was a special racing job all the way through. A sum amounting to well over $1,500 is said to have been spent on its construction. More credit should be given the entries who had limited capital and spent their sums on alterations which gave their Fords the most speed.

Harvey's Car a Masterpiece

Harvey's car was a masterpiece of workmanship and is prophetic of what may come in cars with small motors capable of attaining high speeds. In action it was like a Schubert symphony, smooth and harmonious. The block bore the Ford stamp. Internally, however, the motor had more bore and stroke, larger valves, racing camshaft—in fact, is so altered that there was little Ford left. The frame is hung low on heavy cantilevers. The exhaust is carried out through four straight pipes into an exhaust tube on the side which is large enough to take care of a 300 cu. in. motor. The magneto is Bosch, there is a Master carbureter, Rudge-Whitworth racing wheels and Goodyear cord tires.

The car which bore No. 37, built and driven by B. F. Davis, Paris, Ill., is a typical representative of how a Ford motor may be coupled with hybrid parts to make a car which is capable of close to 70 miles per hour. Davis won the 30-mile Illinois State championship, but unfortunately broke a rod in the free-for-all when he was running close second to Harvey.

The motor is a Ford. The bore is the same and the stroke. Valves were enlarged to 1⅝ in., Rich tungstens being used. The carbureter is a Master and the magneto a Bosch. The camshaft was not altered. A Monroe frame is used to undersling a Scripps-Booth axle on the front and a combination Ford and Scripps-Booth axle on the rear. This combination includes a Ford differential and housing with Scripps-Booth floating axle. The high Champion radiator and formidable-looking streamline body gave the car a full-fledged racing appearance.

Another car of similar lines was No. 39, built by H. B. Wilson, Dewitt, Ill. Mechanical trouble made it a poor contender in the races, but in preliminary trials it showed commendable speed. Here, too, a Champion radiator heads a symmetrical streamline body. Bosch and Master equipment is evident and Universal Welding Co. wire wheels are fitted. The builder ground his camshaft to quicken the lift and drop and installed lynite pistons.

Methods of Lowering Frame

The most varied of all alterations were the methods of lowering the frame. Car No. 38, Chic Wheeler, Des Plaines, Ill., lowered the front with a special axle, as shown in Fig. 1. In the rear, refer to

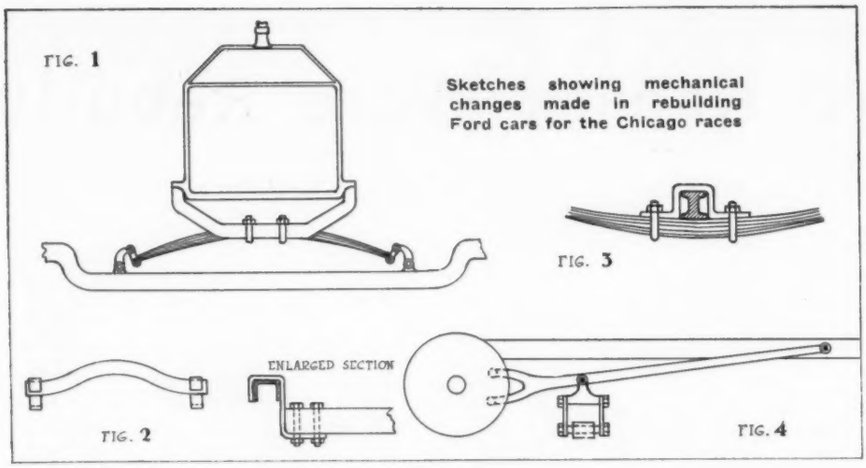


Fig. 2, he sawed off 4 in. from the frame on each side and suspended the regular Ford rear-spring hanger on two goosenecks made out of flat bar steel. This gave him a frame 4 in. lower than is found in the stock Ford. He also used Bosch for ignition and the carbureter is a Rayfield.

Another unique method of lowering the frame was found in car No. 10, driven by Hugo Zeeh, Oak Park, Ill. As shown in Fig. 3, the front axle was underslung by the use of a U-shaped piece of flat steel stock over the axle and fastened to the springs with clips as shown. In the rear, he utilized the brake arm studs in the rear axle hub to fasten a forked bar from the axle to the frame as shown in Fig. 4. About two in. forward from the fork he bolted shackles and suspended the transverse spring from these. These alterations gave him about 4 in. drop.

Car No. 6, which finished third in the free-for-all, certainly performed differently than it looked. It was an old Ford in the first place, and had seen much service. There was nothing much special about it except that the axle was geared up and the timing set ahead. Underneath the gearset was a battered sheet metal pan, "to keep the oil from the track," according to Henry Mueller, Chicago, the driver and owner. This pan was fastened to the frame with hay wire —all in all a crude looking job. But the car had the stuff and the prize won certainly bought that battered pan and the hay wire.

Hay Wire Holds Hood

Car No. 3, V. W. Jury, Chicago, promised to be a strong contender. One little oversight put it in the discard, and that was that the driver relied on hood fasteners instead of a strap. He made four stops in the 50-mile event to fasten down the hood and finally secured it in place with a dose of the ever-present hay wire.

Car No. 24, driven by Emil Laznasky, Mt. Prospect, Ill., which got second place in the big race, had about as little done to it to make it fast as any of the contenders who placed. The driver, who was also the builder, against the advice of friends, removed the magnets from the flywheel of the Ford motor and installed an Atwater-Kent distributing system. He attributes his success to this disregard of his friends' advice. About the only other change from a regular Ford was the use of a Master carbureter and a V-shaped tank soldered to the front of the radiator to give additional water capacity.

A majority of the cars in the race were provided with some kind of an extra carrying space for water. There were tanks soldered on the front and rear, of all shapes and degrees.

What few there were who did not alter the radiators were frequent visitors to the pits for new water supply.

One Burned Kerosene

Car No. 40 was entered by J. W. Duntley, originator of pneumatic tools and well-known inventor. It embodied his latest invention, a kerosene burning atomizer. The device will start a Ford cold on the second or third turn of the crank. It weighs but 1¼ lb. There are sixteen parts which go to make up the complete device. Kerosene is admitted to the atomizer into an ordinary float chamber, but that is all of the device which resembles a carbureter. The fuel is sucked into a tube in which there are a series of slits for atomizing. Over this tube is another sleeve with more slits. Mixture is made rich or lean by matching up the slits, for a lean mixture and all of them for a real rich mixture. This operation is controlled by a lever on the steering column. The throttle is a dished disk which slides over the outside sleeve, thus regulating the amount of fuel admitted to the motor. The car entered the race on three-quarters kerosene and one-quarter gasoline, but the atomizer will handle straight kerosene with good results. Duntley offered $200 for any other kerosene burning Ford which would race him, but did not get an acceptance.

As a summary, speed seemed to have been attained by the use of special magnetos or distributers, carbureters of larger capacity than the Ford, lowered frames, higher gear ratios, and timing set ahead, with a few of the camshafts special and some of them ground to sharper points by the builders.

Effect of the War on Aeroplane Engine Design

(*Continued from page* 433)

to allow for the increased engine load when laying his plans.

Several of the foremost engineers have had under consideration for some time the construction of huge battle planes, but have had to let them rest until the certainty of their getting an engine of the power capable of driving a machine of this size. In most cases, the question of final drive for propellers is undecided, as with a unit of 400 or 500 hp., the proper location for it would be inside the fuselage, where it could be under observation and not an object of head resistance.

In this case the question of gearing would not be of moment, as in all likelihood the drive would be through shafts to two outboard propellers, similar to the Zeppelin method of drive.

On some of the smaller engines of 250 hp., the question of cooling has been worked out to very nearly the limit, and a finished radiator for a Rolls-Royce of this power only weighs 62½ to 63 lb., with a correspondingly small amount of water.

In conclusion, the writer wishes to emphasize the fact that in designing an engine for aeroplane use, consideration should be given to the service that this particular engine is intended for, and that if possible there should always be co-operation between the designers of the engine and the plane, for while it is slower work, it certainly will give greater satisfaction in the end, and should produce better results. In this way it is often possible to eliminate certain weights by lightening up on various parts, and incorporating other features that will facilitate and simplify the work as a whole. Numerous incidents can be cited where this has made a pronounced improvement.

Factory Miscellany

Lexington Adds—The Lexington-Howard Motor Co., Connersville, Ind., is planning a one-story addition 125 by 200 ft.

Duryea May Locate in Baltimore—The Duryea Motors Co., Philadelphia, Pa., is seeking a site for a plant in or near Baltimore.

Pilot to Double Capacity—The Pilot Motor Car Co., Richmond, Ind., is having plans prepared for doubling the capacity of its plant.

Alter to Build in Grand Haven—The Alter Motor Car Co., Plymouth, Mich., is planning to erect a factory, 60 by 400 ft., at Grand Haven, Mich.

Field Motor's Factory—The Field Motor Co., Grand Rapids, Mich., will build a one-story factory, 50 by 100 ft., for the manufacture of gasoline and kerosene engines.

Dunlop Tire to Build—The Dunlop Tire & Rubber Goods Co., Toronto, Ont., is contemplating the erection of a factory building to be of brick and mill construction.

Guide Lamp Adds—The Guide Motor Lamp Co., 114th and Madison Streets, Cleveland, is building a one-story brick addition to the present building which will cost about $11,000.

Sherman Carbureter Co. Formed—The Sherman Carbureter Co., Buffalo, N. Y., has been formed to manufacture carbureters and automobile supplies. W. H. Grever, 146 Hughes Avenue, and R. C. Harrison and J. F. Sherman, Buffalo, are the incorporators.

International Rubber to Build—The International India Rubber Corp., South Bend, Ind., has contracted for the erection of the first unit of its tire factory. The dimension of the building will be 382 by 80 ft., and will contain 28,700 sq. ft. of floor space.

Canadian Factory Items—A contract has been given for the erection of a factory in Oshawa, Ont., for the Chevrolet Motor Co., to cost $40,000. The Chevrolet company will also build another structure there at a cost of $50,000.

The Motor Products Co. will build a plant at Walkerville, Ont.

Mitchell Wagon Enlarges—The Mitchell Wagon Co., Racine, Wis., manufacturer of automobile bodies, is enlarging its operating departments to bring the output up to the mark required by its contracts, the principal one being with the Mitchell Motors Co. The Mitchell output is being largely increased, bringing an unusually heavy demand upon the body makers.

Tire Fabric Plant for Niles—Work is in progress in Niles, Mich., on the construction of what is said to be the first tire-fabric plant west of the Alleghenies. The plant is being built for the Towar Cotton Mills, Inc. Officers of the company include: President, S. C. Towar, who has been sales manager of the Acme Belting Co., Niles, and secretary and treasurer, G. A. Merritt, Detroit.

Wis. Factory Items—The Waukesha Motor Co., Waukesha, is having plans prepared for a new administration building, to be of fireproof construction, 36 by 132 ft. in size, two stories and basement. The completion of the new offices will release considerable floor space for manufacturing purposes, which is badly needed because of the great rush of orders.

To temporarily relieve the congestion in the plant and pending the completion of a mammoth new assembling shop, the Falls Motors Corp., Sheboygan Falls, has erected a large circus tent in which assembling operations will be carried on night and day for at least 2 months. The company added fifty skilled mechanics to the force during last week and is taking competent help as rapidly as it presents itself.

F. W. D. Tractor Seeks Plant Location—The Four Wheel Drive Tractor Co., originally organized at Antigo, Wis., and later by Clintonville, Wis., capital, is considering propositions from no less than six large Wisconsin cities for the location of the works, which is about to be undertaken. Among the bidders for the industry are Oshkosh, Appleton, Green Bay, Wausau and Fond du Lac.

Work Started on Stewart-Warner Addition—Work now is well under way on the first of a large group of new iron and brass foundry buildings at the Warner works of the Stewart-Warner Speedometer Corp., Beloit, Wis. The work of moving the equipment of the present shops to the recently enlarger main works in Chicago has been completed. Henceforth the Beloit works will devote all attention to the manufacturing of raw material, and finishing, assembling and other final processes are concentrated in Chicago. The new iron foundry will be 180 by 480 ft., and other buildings in proportion. Harold Hemenway, East Moline, Ill., has been appointed general superintendent at Beloit to succeed A. E. Moon, who is promoted to an executive position in Chicago.

The Automobile Calendar

ASSOCIATIONS

Sept. 25—Indianapolis, Convention for Formation of Indiana Automobile Trade Assn., under auspices of N. A. T. A., Hotel Claypool.

Oct. 2-5—St. Louis, Fall Meeting Assn. of Automobile Accessory Jobbers.

Oct. 2-7 — Kansas City, Mo., Dealers' Show, American Royal Live Stock Show; Kansas City M. C. Dealers' Assn.

Oct. 13—Flint, Mich., Fall Meeting National Assn. of Automobile Accessory Jobbers.

Dec. 2-9—Electricians' Countrywide Celebration.

CONTESTS

Sept. 16—Providence Speedway Race.

Sept. 18—North Yakima, Wash., Track Race, Washington State Fair.

Sept. 29—Trenton, N. J., Inter-State Fair. H. P. Murphy, Racing Sec.

Sept. 30—Astor Cup Race, 250 miles, Sheepshead Bay Speedway, Sheepshead Bay, N. Y.

Oct. 7—Philadelphia Speedway Race.

Oct. 7—Omaha Speedway Race.

Oct. 14 — Chicago Speedway Race.

Oct. 19—Indianapolis, Ind., Race, Indianapolis Motor Speedway.

Oct. 21 — Kalamazoo, Mich., Track Races, Kalamazoo, Motor Speedway.

Oct. 22-23—Los Angeles, Cal., Commercial Car Reliability Tour.

Nov. 16 and 18—Santa Monica, Cal., Vanderbilt Cup and Grand Prix Races.

April, 1917—Los Angeles to Salt Lake City Road Race.

SHOWS

Sept. 10-16 — Milwaukee, Wis., Show, Wisconsin State Fair, Machinery Bldg.

Sept. 25-30—Salem, Ore., State Fair, Joseph M. Rieg, manager.

Oct. 14 - 31 — Dallas, Texas, Show, State Fair.

Jan.—First Pan-American Aeronautic Exposition, New York City; Aero Club of America, American Society of Aeronautic Engineers, Pan-American Aeronautic Federations.

Jan. 6-13, 1917—New York City, Show, Grand Central Palace, National Automobile Chamber of Commerce.

Jan. 13 - 20 — Montreal, Que., Show, Montreal Automobile Trade Assn.

Jan. 20-27—Montreal, Que., Automobile Trade Assn.

Jan. 27-Feb. 3, 1917 — Chicago, Ill, Show, Coliseum, National Automobile Chamber of Commerce.

Feb.—Newark, N. J., Show, First Regiment Armory.

Feb.—St. Louis, Mo., Show, Auto Manufacturers, and Dealers' Assn.

Feb. 3-10—Minneapolis, Minn., Show, Minneapolis Automobile Trade Assn.

Feb. 26-March 3—Omaha, Neb., Show; Auditorium, Omaha Automobile Show Assn.

March 3-10 — Boston, Mass., Show, Mechanics' Bldg., Boston Automobile Dealers' Assn.

March 6-10—Ft. Dodge, Iowa, Northern Iowa Show, New Terminal Warehouse, G. W. Tremain, Secretary.

TRACTOR

Sept. 11-16 — Milwaukee, Wis., Fall Show, Wisconsin State Fair, Milwaukee Automobile Dealers.

Oct. 14-29—Dallas, Tex., Demonstration, Texas State Fair.

The Week in the Industry

Baltimore Trade Items—H. S. Block, who for some years has been the Chandler distributor for Maryland, is now looking after the retail business for the Chandler in Baltimore at 1014 Morton Street.

The Beam Motor Car Co., 1114 Cathedral Street, former Chandler agent, is handling the Allen and the Premier.

The Wilson Motor Co., 605 West North Avenue, former Mitchell and Maxwell distributor, is now handling the Liberty and the Grant lines.

Day-Elder motor trucks are being handled in Baltimore, with the showrooms in the new Mid-City Garage, 29 South Charles Street. H. H. Day is the Baltimore and Southern distributor and J. A. Muir is in charge of the local sales department.

Bowser Booster Out — The *Bowser Booster* is the name of a new publication at the S. F. Bowser Tank & Pump Company, Fort Wayne, Ind. The paper is intended to deal entirely with the activities of the factory and office, as the *Bowser Booster* is printed in the interests of the salesmen.

Philadelphia Items—The Wagner Electric Mfg. Co., St. Louis, has opened a branch and service station at 1430 Vine Street, Philadelphia, in charge of N. A. McCoy.

B. F. Hoffman, sales manager for the Ford Motor Co., Philadelphia, will leave that company about Oct. 1 and open up the Hoffman Motor Co. at 235 North Broad Street, the quarters now occupied by the Buick agency. Mr. Hoffman will handle Ford cars under the new plan.

Pacific Coast News—The Al. G. Faulkner Co., Los Angeles, Cal., southern California and Arizona distributor of the Marmon, will occupy a new two-story brick and stone building at the corner of Figuroa and Seventeenth Streets on or before Oct. 1.

Both the wholesale and retail selling privileges on the Firestone tire in Portland, Ore., were conferred by F. W. Thatcher, manager of the Portland branch of the company, to B. E. Boone & Co., retail Chevrolet dealer. The Firestone branch will retain its present quarters at 65 Park Street, North, and will take care of the territory outside Portland, as in the past, and assist the new organization to obtain additional city business.

Columbus News Items—E. P. Strang, district manager of the Deneen Motor Co., a newcomer in the motor truck field, arrived in Columbus recently for the purpose of establishing an agency.

The Owen Magnetic Motor Car Co., located on North High Street, Columbus, has taken the central Ohio agency for the Velie.

E. H. Huffman, 105 East Town Street, Columbus, has taken the local agency for the Stephens Six.

Cruikshank, Son & Robinson is the name of a new retail firm at 402 Schultz Building which will handle the Argo and Pathfinder in central Ohio territory.

The Ohio Metz-Elcar Co., 211 North Fourth Street, Columbus, has taken Ohio distribution for the Metz and Elcar. W. A. Albaugh is general manager.

St. Louis Trade Happenings—A. P. Seigmund, St. Louis, has been appointed manager of the truck department of the Detroit Electric Car Co., Twentieth and Locust Streets, that city.

The Gibson Motor Car Co., the Dodge distributor in Webster Groves a St. Louis suburb, is erecting a brick and tile showroom and service department on Lockwood Avenue.

The Ebbeler Motor Car Co., St. Louis, has taken the agency for the Mitchell cars.

A. G. Cameron, Dallas, Tex., is the new manager of the St. Louis branch of the Goodyear Tire & Rubber Co. Mr. Cameron has been in the Goodyear service as Dallas manager 3 years. He succeeds W. E. Finney, transferred.

G. C. Brinkmann, St. Louis, has resumed the management of the Brinkmann Motor Co., Maxwell distributor.

The McQuay-Norris Mfg. Co., St. Louis, has added the following mechanical engineers to its sales force: H. H. Cummings, Chicago; R. B. Pratt, Milwaukee; F. L. Stevenson, Detroit.

R. W. Immasche, St. Louis, recently appointed distributor for Jordan cars, will incorporate under the name The Jordan Motor Sales Co.

G. H. Scott, Columbia, Mo., manager of the branch in that city of the Hudson-Phillips Motor Car Co. of St. Louis, has been made manager of the company's wholesale department, vice L. T. Hudson, who resigned to accept a position in Memphis.

W. C. Capen, St. Louis, manager of the White branch in that city, has been transferred to an executive position at the factory in Cleveland. He will be succeeded in St. Louis by G. E. Armstrong, who has been with the Locomobile Co. in New York City and at the factory.

Canadian Trade News—Aubrey Hurst, 32 Front Street, West, Toronto, Ont., has been appointed sole Canadian representative for the Detroit Weatherproof Body Co., Detroit.

The Breen Motor Co., Winnipeg, Man., has been appointed sole agent in Winnipeg for the Chalmers car, recently handled by Joseph Maw & Co.

Mountain Trade—The Headington Auto Co., Denver, Metz, Inter-State, Enger and H. A. Lozier distributer for Colorado and Wyoming, has added the Sun distributing agency for the same territory.

The J. S. Morrison Auto Co., Denver, Allen and Oakland distributer for Colorado and Wyoming, has given up the Oakland and is handling the Allen exclusively.

The Norton-Buick Co., Denver, Buick distributer for Colorado and southern Wyoming, has secured the G. M. C. truck-distributing agency for the same territory. The headquarters will soon be moved from 25 East Colfax Avenue to 1535 Lincoln Street.

The Turner-Deigle Motor Co., Denver, is the new name for the Turner Commercial Auto Equipment Co., formerly distributer for the Smith Form-a-Truck, at 455 Broadway, which has given up that business and taken one of the local Ford agencies.

Lee McGee, Denver, has opened a Stephens distributing agency for Colorado, Wyoming and New Mexico at 1908-1914 Broadway.

The Tibbals-Anderson Motor Co., Denver, Jackson distributer for Colorado, Wyoming and New Mexico, with headquarters at 1188 Broadway, has added the Elcar distributing agency for the same territory.

The United Motor Sales Co., Denver, has opened a Ford agency and service station at 153-155 Broadway.

The Beardsley Electric Co., Denver, is the name of a Colorado distributing agency for the Beardsley recently opened at 1431-1433 Cleveland Place. The business is in charge of G. A. Showers, and A. K. Ancker is sales manager.

S. W. News Items—C. L. Jarrett, Springfield, Mo., will distribute the Chevrolet in that territory.

The Martin Motor Co., Springfield, Mo., has been organized to handle Maxwell in the Springfield territory.

The Howard & Murphy Motor Co., Kansas City, Mo., has employed E. J. England, formerly sales manager of the Karshner Motor Car Co., as sales manager.